

PC MAGAZINE

LIBRARY

MAGAZINE

COMPUTERS

**486SX Machines:
Great for Intel, but
What About You?**

HARDWARE

**Choosing and Using
Hard Disks:
What to Buy,
How to Upgrade**

SOFTWARE

**PC Labs Tests 10
Top Spreadsheets**



VS.



**The Latest from
Borland, Lotus,
Microsoft, CA
And Others**

DECEMBER 31, 1991

THE INDEPENDENT GUIDE TO PERSONAL COMPUTING

VOLUME 10 NUMBER 22

BREAKTHROUGHS!

The 8th Annual Awards for Technical Excellence

- The Database That's 100 Times as Fast
- The Network Without Wires
- The Utility That Doubles Your Hard Disk
- The Game That Lets You Rule the World
- The 386SX You Really Can Carry
- And More...



The first
word processor
that works
like second nature.

**"Now
Includes
MS-DOS® &
Microsoft®
Windows™
3.0,
Same Low
Price"**

**33-MHz i386DX
32-Bit EISA
Upgradeable
2-MB RAM
80-MB Hard Drive
Super VGA Adapter
Super VGA Monitor**

\$3,495

And with ALR's modular
"Just Upgrade the CPU!"™ sys-
tem design, you can
affordably keep pace
with the growing de-
mands of your business
by simply swapping your
BusinessVEISA's present
CPU with a more power-
ful one.

To find out where you
can test drive a
BusinessVEISA bundle
today, call:

1-800-444-4ALR

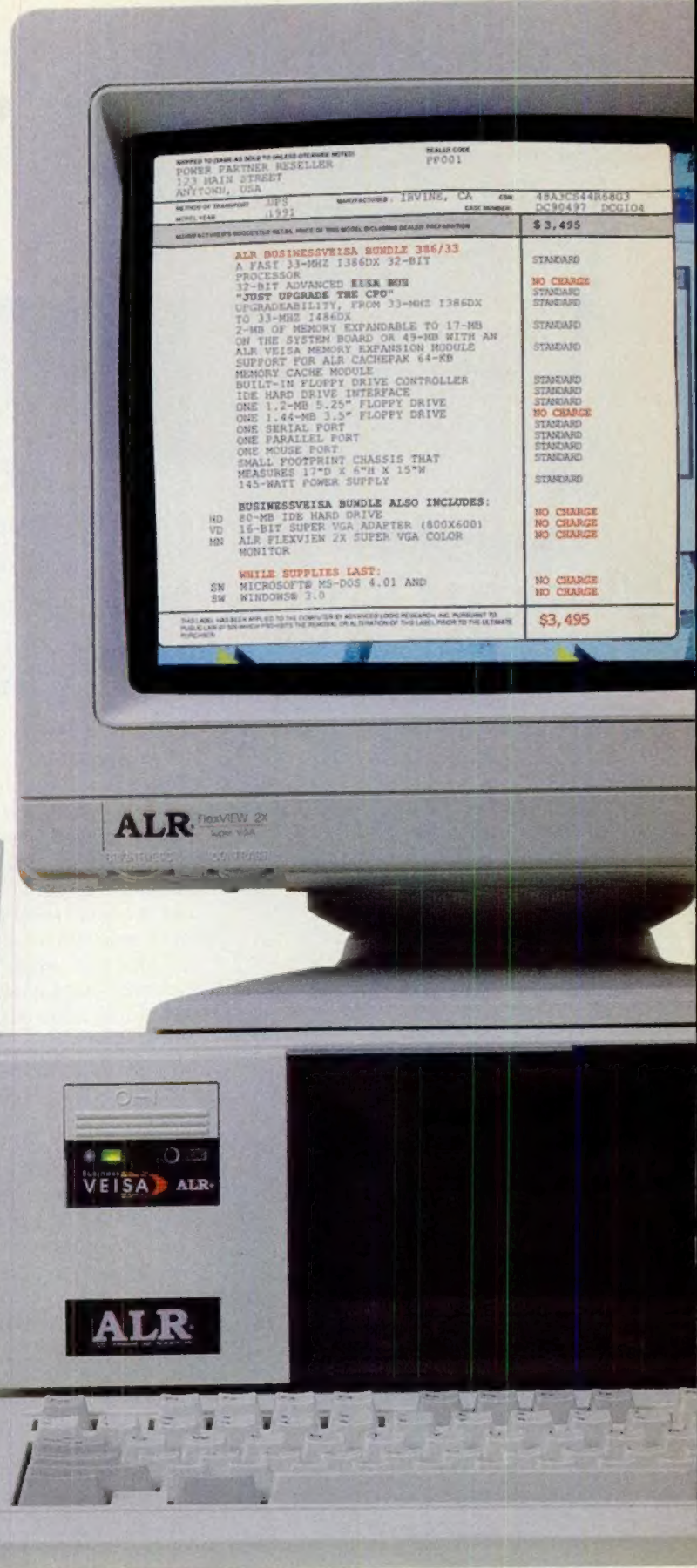
ALR®

Advanced Logic Research, Inc.
9401 Jeronimo Irvine, CA 92718
TEL: (714) 581-6770 FAX: (714) 581-9240
Available at these nationwide locations

ComputerLand **Connecting Point** **ENTRE**
COMPUTER CENTERS

IBM BUSINESSLAND

**ALR Power Partner
Resellers**



CIRCLE 165 ON READER SERVICE CARD

SUPER CARTRIDGE.



SUPER DEAL.

Here's a super value for you: IQ Engineering's new Super Cartridge™ DJ/500 is packed with more fonts, more sizes and more symbols than other leading HP DeskJet® font cartridges. Yet it costs 20% less!

The Standard Edition supports more than 2,000 fonts and symbol sets when used with your HP DeskJet 500 printer—including international symbols in 30 languages. Based on six popular type families, it contains fonts from 4 to 24 points, and is compatible with all major software applications. This could easily be the only font cartridge you'll ever need.

But if you do need more, go Professional. The Professional Edition features the Standard Edition cartridge plus a headline cartridge with 11-point type to 30-point type for presentations and desktop publishing. And both Super Cartridges are also available for HP DeskJet Plus users, too.

The new Super Cartridge DJ/500 from IQ Engineering. It's more cartridge than you could ever imagine. For less cash than you'd ever expect.

PRICE REDUCED!

Cartridges Now Start At \$99
Call 1-800-765-3668

Super Cartridge™

IQ ENGINEERING

685 N. Pastoria Ave., Sunnyvale, CA 94086
Super Cartridge and IQ Engineering are trademarks of IQ Engineering.
DeskJet and LaserJet are registered trademarks of Hewlett-Packard Company. © 1991 IQ Engineering. All rights reserved.

CIRCLE 325 ON READER SERVICE CARD

Inside



The Technical Excellence Awards ceremony in Las Vegas.

No story generates more controversy at *PC Magazine* than the annual Technical Excellence Awards.

Within minutes of the first discussion in an e-mail message, dozens of messages began to fly from every corner of the country. All of the magazine's editors took part; some were quick to praise their most recent discoveries, and others could only find fault with every nomination.

Several hundred messages were posted, many composed of passionate defenses of products that no one else seemed to appreciate quite as much as the author did. At times, it seemed that some of the writers were devoting all of their time to the nominating process. John Dvorak even published a newsletter to keep tabs on the debate.

After several weeks of this, I began distilling the most hotly debated products into a final list. A vote was taken, but the results were kept secret.

The winners were announced for the first time in a formal ceremony held in Las Vegas during Comdex, the PC industry's annual convention.

The ceremony is a lavish multimedia extravaganza, replete with laser



light shows, thundering music, and a flash of Las Vegas glitz.

And while it's an impressive show, to the editors who debated the nominations with passion and zeal it seems like the calm after the storm.

You can learn about the winners and read some of the praise in our cover story, "8th Annual Awards for Technical Excellence."

By the way, if you're wondering why this story appears one issue earlier than usual, it's because Comdex was held in October rather than November. The schedule for the annual "Best of the Year" story remains the same; it will appear in the next issue, the first issue of 1992.

Of course, the technical excellence debates didn't halt work in the labs. Comparisons of networked CD-ROM drives and 20-MHz 486SX PCs are in this issue. And in an in-depth review of spreadsheets, we compare the newest product—*1-2-3 for Windows*—with its nine competitors and reach some surprising conclusions about *Windows*' performance. You'll find fascinating results in the benchmark tests that appear in that story.—Gus Venditto ■

PC Magazine: The Independent Guide to Personal Computing, ISSN 0898-8507, is published biweekly except in July and August for \$44.97 for one year. Ziff-Davis Publishing Co., a division of Ziff Communications Co., One Park Ave., New York, NY 10016. Second-class postage paid at New York, NY 10016 and at additional mailing offices. POSTMASTER: Address changes to PC Magazine, P.O. Box 54063, Boulder, CO 80321-4063.

This is your dot matrix,
printing.



This is our new quiet 2624,
printing.



This is the one you've been waiting for. Panasonic® presents the first of a new generation of quiet dot matrix printers.

The KX-P2624 wide-carriage.

It doesn't scream, it whispers. Through multi-part forms, those 'industrial strength' spreadsheets, and your customer correspondence. And does them all with ease, speed and the superb reliability we've built a reputation on. It has all the features you've come to expect from the leader in dot matrix printing. And then some. One super letter-quality and seven letter-quality fonts. Multiple paper paths. An LCD display. A top speed of 300 cps in draft mode, 100 cps in letter quality. A two-year limited warranty on parts and labor.* And serene quiet.

For more information call us toll-free: 1-800-742-8086. Or, better yet, see your Panasonic dealer.

You'll like what you don't hear.

*Printers, Computers, Peripherals,
Copiers, Typewriters & Facsimiles*

Panasonic
Office Automation 



November 26, 1991
Panasonic KX-P2624

What Comes After Introducing Ne

Welcome to the world of multi-dimensional modeling & viewing.

Unlike two-dimensional spreadsheets, CA-Compete! lets you model up to 12 different dimensions and navigate between them instantly with the click of a mouse. And



MICROSOFT
WINDOWS
Screen 111 Copyright Product

CA-Compete!™ speaks English too, so you can use recognizable names you define, like Sales, Units, Costs and Profit

instead of cryptic column and row references. For smarter decision-

Goal Seek

Target Cell: LPs.Profits.1989.Actual.East

Initial Value: (\$509)

Current Value: (\$509)

Goal Value: 1000

Source Cell to be Modified: Price

Cell Value: 20%

Buttons: OK, Cancel, Audit, Options, Seek, Stop, Restore

making there's a broad range of powerful tools like Goal Seek, Allocate,

Forecast

Units

Post Periods: 1988:1991

Future Periods: 1992:1993

Method: ☒ Regression ☐ Interpolation ☐ Constant rate (PQ)

Growth Type: ☒ Compound ☐ Simple

Define Periods: Time

Buttons: OK, Cancel

and Forecast, so you can perform extensive "what-is" and "what-if" analyses.

You can also trace the origin of any value with a quick,

CA-Compete! - BU

File Edit Formula Format Options Tools

GLOBAL =Sales+Total Cost

Product Actuals - 1989

1989 East Actual

	LPs	CDs	Tapes	Total
Units	19,499	34,678	23,597	77,774
Price	\$0.75	\$1.40	\$1.05	\$1.07
Sales	\$14,624	\$48,549	\$24,777	\$87,950
COGS	\$13,671	\$24,314	\$16,544	\$54,529
SG&A	\$1,462	\$4,855	\$2,478	\$8,795
Total Cost	\$15,134	\$29,169	\$19,022	\$63,325
Profits	(\$509)	\$19,381	\$5,755	\$24,627

Eastern Forecast - Pdt A

LPs East Plan

	1989	1990	1991	1992
% Sales	100.00%	100.00%	100.00%	100.00%
Sales	100.00%	100.00%	100.00%	100.00%
COGS	81.57%	79.63%	77.77%	75.93%
SG&A	12.00%	12.00%	12.00%	12.00%
Total Cost	93.57%	91.63%	89.77%	87.93%
Profits	6.43%	8.37%	10.23%	12.07%
Tax	2.70%	3.52%	4.30%	5.08%
Net Income	3.73%	4.86%	5.93%	6.99%

Ready

er Spreadsheets? w CA-Compete!

PLAN1.MDL Window Help

Variance Report

Variance Report by Product
tern Region -- 1989

	Actual	Plan	Variance
	19,499	21,344	(1,845)
	\$0.75	\$0.75	\$0.00
	\$14,624	\$16,008	(\$1,384)
of Goods Sold	\$13,671	\$13,058	\$613
g & Admin.	\$1,462	\$1,921	(\$459)
Cost	\$15,134	\$14,979	\$155
	(\$509)	\$1,029	(\$1,539)

	Actual	Plan	Variance
	34,578	30,200	4,478
	\$1.40	\$1.40	\$0.00
	\$48,549	\$42,280	\$6,269
of Goods Sold	\$24,314	\$18,476	\$5,838
g & Admin.	\$4,855	\$5,074	(\$219)
Cost	\$29,168	\$23,549	\$5,619
	\$19,381	\$18,731	\$650

	Actual	Plan	Variance
	23,597	26,100	(2,503)

graphical
Audit Trail
Tool.

CA-Compete!
reads and
writes Lotus® 1-2-3®, Excel, dBase®,
ASCII and Script
Files so you can



work with all of
your current files.

And with
Windows'
Dynamic Data
Exchange,
you can link
your data
dynamically
with any
other
Windows
program.

Call 1-800-645-3003 today to
get a CA-Compete!
working model.

It's your chance
to get a free glimpse
of the future.

Audit Product Actuals - 1989

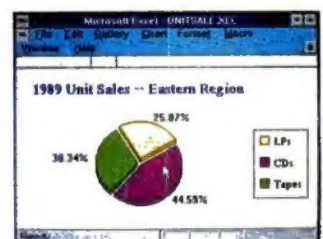
<Sales>	[509,383,951,817,33]
<Sales>	SGTA [191,33,633,951,817]
<ALLOC>	Units Total [1,367,208,951,817]
<GUM>	[545,29,186]
<GUM>	[87,950,3]
<Price>	[1,462,4,25]

19499

CA-Compete!



Chosen "Best of 1990"
by PC Magazine.*



**COMPUTER
ASSOCIATES**
Software superior by design.

*PC Magazine, Craig Stinson, 1/15/91. © 1991 Computer Associates
International, Inc., 711 Stewart Avenue, Garden City, NY 11530-4787.
All trade names referenced are trademarks or registered trademarks of
their respective companies.

UP FRONT

- 4 INSIDE**
- 17 LETTERS**
- 29 PIPELINE**
Gus Venditto
- 35 FIRST LOOKS**
 - **Word for Windows, Version 2.0:** New luxuries in word processing.
 - **MacroMind's Action:** A novel approach to desktop presentations.
 - **Windows Draw:** Micrografx finds a price/performance balance for business graphics.
 - **LapLink Pro:** Goes beyond file transfer.
- 61 NEW AND IMPROVED**
Nate Zelnick
- 71 READ ONLY**
Matthew J. Ross
- 75 TOOLKITS**
Trudy Neuhaus

COLUMNISTS

- 79 MICHAEL J. MILLER**
The Merging of Windows Word Processors
- 85 BILL MACHRONE**
The Gospel, According to Intel
- 91 JOHN C. DVORAK**
The PCMCIA PC-Card and the Future
- 93 Inside Track**
- 97 JIM SEYMOUR**
Pricing LAN Software Sensibly
- 105 WILLIAM F. ZACHMANN**
Farewell to (Software) Innocence?

COVER STORY

- 110 TECHNICAL EXCELLENCE**
8th Annual Awards for Technical Excellence
Bill Machrone and Michael J. Miller/ Our annual awards pay tribute to the products that symbolize the unrelenting pursuit of innovation in the computer industry.

155 Awards for Technical Excellence: Previous Winners



FEATURES

159



COMPUTERS

486SX: Great for Intel, but What About You?

Jim Seymour/ PC Magazine Labs tests 19 of the first 486SX-based systems on the market in an attempt to find out who benefits most from these machines—Intel or you.

- | | |
|---------------------------------------|--|
| 167 AcerPower 486SX | 212 Ergo Moby Brick 486SX-20 |
| 170 ACMA 486SX/20 | 215 Everex Tempo 486SX/20 |
| 177 ALR BusinessStation 486ASX | 218 Hyundai Corporate Series 486SX/20 |
| 184 American Mitac 4270E | 220 IBM PS/2 Model 90 XP |
| 190 Ares 486-20SX Sonic | 222 Leading Technology PC Partner VX |
| 192 AST Premium II 486SX/20 | 226 Novas 486SX-20 |
| 195 Austin 486/SX20 Winstation | 231 Standard 486SX/20 Windows Workstation |
| 201 Blackship 486SX/20U | 234 Swan 486SX |
| 202 C ² Micro 486SX | 236 Zeos 486SX-20C |
| 211 Dell PowerLine 420DE | |

160 486SX: What Speed Advantage?

- 162** Price/Performance Index
- 164** Editors' Choice
- 177** Summary of Features
- 182** Performance Tests

241 SOFTWARE

Spreadsheets Begin to Put the User First

Craig Stinson/ The arrival of a Windows version of Lotus 1-2-3 to compete with Microsoft Excel marks the beginning of a new era. Spreadsheets from \$49 to \$595 are starting to offer tools to automate the simple tasks that make up the majority of your spreadsheet work, and you don't have to be a Windows user to reap the benefits.

- 255** CA-SuperCalc
- 262** InstaCalc
- 265** Lotus 1-2-3 for DOS, Release 2.3
- 273** Lotus 1-2-3 for DOS, Release 3.1 Plus
- 275** Lotus 1-2-3 for Windows
- 285** Lucid 3-D
- 292** Microsoft Excel
- 294** PlanPerfect
- 300** Quattro Pro
- 309** Wingz

- 252** Editors' Choice
- 264** Summary of Features
- 285** Performance Tests
- 299** View Your Data from Every Angle with ProCalc 3D



FEATURES

313 HARDWARE

Choosing and Using Hard Disks

Winn L. Rosch / If you're in the market for a new hard disk, now is the time to buy. But before you do, consider size, speed, interface options, and new technologies.

314 Performance Tips

315 Glossary

318 How the Interfaces Compare

333 CONNECTIVITY

Networking CD-ROMs:

The Power of Shared Access

Ed Perratore / CD-ROMs are the obvious choice for accessing large amounts of data, but you're not getting the most out of this powerful solution unless your CD-ROM drives are networked. Here, we look at solutions from five vendors that make valuable information simultaneously accessible to multiple users.



348 CD Server/386 and CD Connection

355 CorelDriver Optical Disk Interface Kit

356 CD Net Integrated System Model 314 and CD Net

359 SCSI Express

361 Opti-Net

335 Sharing CD-ROMs on DOS-Based LANs

338 A CD-ROM Networking Topology

340 Editors' Choice

343 Jukebox Minichangers: Inexpensive Multiple-CD Access, but Not for Every Network

350 Summary of Features

352 Performance Tests

AFTER WORDS

433 ADVISOR

Joe Salemi / Access AppleTalk with your PC; speed up dBASE performance on a LAN; portable printers and faxes; what products you need for dynamic data exchange.

471 AFTER HOURS

■ *Reader Rabbit 2*: Return to Wordsville for the next generation of learning fun.

■ *Kid Pix*: A paint program just for kids.

476 ABORT, RETRY, FAIL?

Bill Howard

370 PC MagNet News
409 Direct Marketing Connection
435 Marketplace
436 Premier

459 Reader Service Card
465 Index to Advertisers
466 Advertisers' Product Index
469 Editorial Product Index
468 Coming Up

PRODUCTIVITY

365 UTILITIES

Douglas Boling/

WINNAV.EXE

Manages Your Files

Under Windows

371 ENVIRONMENTS

Charles Petzold/

Exploring Waveform

Audio: Building a Digital Tape Recorder

377 POWER PROGRAMMING

Ray Duncan/

Optimizing Assembly Language Programs, Part 3

381 WINDOWS

Fran Finnegan/

The real purpose of .TMP files; overcoming the

Program Manager's command line limit;

enlarging Program Manager fonts.

385 DATABASES

Sal Ricciardi/

Two ways to get the current drive letter in your

Clipper applications.

387 SPREADSHEETS

Craig Stinson/

Going beyond the 240-character width limit

when printing in Lotus

1-2-3; a macro that creates a histogram for

any column of data.

391 THE WORKING WORD

M. David Stone/

Achieve true

WYSIWYG by

matching your screen

fonts to your printer

fonts.

395 USER-TO-USER

Neil J. Rubenking/

Create a special

floppy disk to speed

your system's boot-

up; add comments to

batch files without

slowing them down;

an easy way to

review the files

you've worked on

since your last

backup.

399 LANGUAGES

Trudy Neuhaus/

Discover the power of

Turbo Pascal's typed

constants; perform

exact currency

calculations with this

QuickBASIC function.

403 TUTOR

Jeff Prosser/

When and why you might

need to use SHARE

under DOS 5.0;

replace internal DOS

commands with your

own utilities.

407 CONNECTIVITY

Frank J. Derfler, Jr./

Backing up on a LAN;

printing to a

networked printer

from a single-user

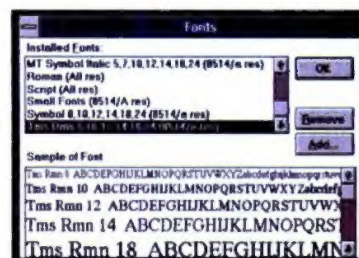
program; printing

large graphics files

faster; maintaining

file-level security;

using flow control.



The Working Word, page 391.



Publishing Director Bill Machrone

Editor-in-Chief Michael J. Miller

Editor Joel Dreyfuss

Executive Editors Bill Howard, Gus Venditto

Workgroup Systems Editor Frank J. Derfler, Jr.

Senior Editors Trudy Neuhaus (Productivity), Robin Raskin (First Looks)

Senior Editor, West Coast Christopher Barr

Managing Editors Diane D'Angelo, Paul B. Ross

Assistant Managing Editor Dianne H. McDonald

Manager, Copy Edit Karen A. Carter **Associate Editors** Julie Cohen (PCs), Mary Kathleen Flynn (Hardware),

Matthew J. Ross (First Looks), Edward P. Stevenson (Graphics), Sharon Terdeman (Productivity), Don Willmott

(Software), Jennifer Zaino (Connectivity) **Technical Editor** Neil J. Rubenking **Copy Chief** Glen Becker

Assistant Production Editor Wendy Murch **Staff Editors** Michael Cohn, Gayle C. Ehrenman, Carol Levin,

Michael W. Muchmore, Ann Ovodow, Oliver Rist, Craig L. Stark, Lance N. Ulanoff **Assistant Editors** Jeanne

Albrecht, Nina Barringer, Karen Best, Robin B. Bornstein, Shari L. Girouard, Stephanie Izarek, Catherine

Kunkemueller, Elyn McCasland, Kim Schueler, Emerson A. Torgan, Nate Zelnick **Librarian** Thomas W. Giebel

Library Assistant Dolores Williams **Editorial Assistants** Tin Albano, Daniel A. Begun, Eric Berlin, William P.

Flanagan, Angela Gunn, Susan G. Thomas **Proofreader** Chris Regan **Editorial Trainees** Camille N. Cline,

Bradley C. Grimes **Business Manager** Justine Kasey Gaeta **Associate Business Manager** Allen Wollman

System Support Manager Craig Ellison **Network Administrator** Debbie Lewis **Assistant to the Publishing**

Director David Baker **Assistant to the Editor-in-Chief** Tara Caulfield **Assistant to the Editor** Rita Arahamian

Assistant to the Executive Editors Christina M. Evelyn **Administrative Assistant** Christina Okang

Contributing Editors Frank Bican, Douglas Boling, Bruce Brown, Ray Duncan, John C. Dvorak, Mitt Jones,

Michael J. Mefford, Edward Mendelson, Bill O'Brien, Charles Petzold, Alfred Poor, Jeff Prosser, Winn L. Rosch,

Jim Seymour, Richard Hale Shaw, Barry Simon, Luisa Simone, Craig Stinson, M. David Stone, Ethan Winer,

William F. Zachmann

Support Associate, PC MagNet Louise Laberge **Sysop, PC MagNet** Ken Hipple

Acting Art Director Robert C. Smith **Associate Art Directors** Charles Conover, Renata Gomes, Patricia Isaza

Assistant Art Director Michael L. Graham **Associate Graphics Director** Gary W. Kaplow **Electronic**

Graphic Artists Simone Blank, David Foster, Robin L. Malik **Post-Production Artist** Genevieve Martineau

Assistant to the Director of Design Frieda T. Smallwood

Director, PC Labs C. James Galley III **Technical Director, PC Labs** Robert W. Kane **Project Leaders** Rick Ayre

(Software), Richard Brady (Connectivity), Gabrielle Gagnon (Applications Development), Lori Grunin (Graphics),

Alan M. Stoughton (PCs), Michael J. Zulich (Hardware) **Sr. Programmer** Stuart R. Greenberg Jr. **Programmer**

Bradley G. Epranian **Product Testing Manager** Charles Rodriguez Sr. **Tech. Analyst** Stephen W. Plain Jr. **Tech.**

Analysts Mario Baldasserini, William Bettini **Support Technicians** Melvin Acevedo, Margaret A. Piemonte, Edgar

Rojas **Support Technician Trainees** Laura Cox, Carolyn Falconer **Operations Manager** John R. Delaney

Inventory Control Coordinators Peter Bastide, Rob Graydon, John Jones

Publisher Jeff Ballowe

Director, Marketing Ellen Atkinson **Director, Networking** Anna Zornosa **Events** Stacy O'Connell **Market**

Information Michael Van Engen **Sales Development** Jeff Stanley **Subscriptions** Charles Mast **Single Copy**

Sales James E. Gerth

Assistant Production Director John Ansaldi **Senior Advertising Production Manager** Vicki Egan Root

Advertising Production Manager Lori Iaccino **Advertising Production Assistants** Pam Berkowitz,

Oris D'Amil **Editorial Production Coordinators** Kevin S. Fagan, Jo-Ann Hirschel **Production Systems**

Supervisor Linda Harms **Production Systems Assistant** Lillian Gaffney

Advertising Office: One Park Ave., New York, NY 10016; 800 33 MAG AD, 212-503-5100

Subscription Problems: 800-289-0429, 303-447-9330 (outside the U.S.)

ZIFF-DAVIS PUBLISHING COMPANY

Chairman and CEO Eric Hippeau

President J. Scott Briggs

Executive Vice President Ronni Sonnenberg

Group Vice President J. Samuel Huey

Group Vice President, Worldwide Direct Publications

Jim Stafford

Senior Vice President, Marketing Paul H. Chook

Senior Vice President Rachel Greenfield

Vice Presidents Baird Davis (Operations), Howard D.

Skolnik (Controller), Herbert Stern (Creative Services),

Marian O. White (Research), Bert Lacy (Circulation), James

F. Ramaley (Circulation Services), Ann Pollak Adelman

ZIFF COMMUNICATIONS COMPANY

Chairman William B. Ziff, Jr.

Vice Chairman Philip B. Korsant

President Kenneth H. Koppel

Executive Vice President Philip Sine

Senior Vice President Hugh Tietjen

Vice President, General Counsel, and Secretary

J. Malcolm Morris

(Marketing Services), Roger Herrmann (Production),

Bill Machrone (Technology), Paul Stafford (Classified

Advertising), William L. Phillips, Claude P. Sheer

Executive Director, Information Systems John Helliwell

Executive Director, Ziff-Davis Networks Tony Uphoff

Directors Steven Rosenfield (Business Development),

Jeff Weiner (Corporate Development), Jean Lamensdorf

(Licensing), Gary A. Gustafson (Planning), Walter J.

Terlecki (Production), Dan Leonetti (Sales Training),

Susan Delman (Corporate Marketing), Lewis D'Vorkin

(Editorial), Beth Springer (Ziff-Davis Labs)

Business Manager, Publishing Operations

Tom McGrade

Vice President, Controller, and Treasurer

Patrick J. Burke, Jr.

Vice President, Human Resources

Frederick K. Staudmyer

Vice President, Business Manager T.L. Thompson

Vice President, Chief Information Officer Thor Olson

Vice President, Electronic Editorial Director

Michael Kolowich

Vice Presidents Seth R. Alpert, Steven C. Feinman

Editorial and Business Office: One Park Ave., New York, NY 10016. Editorial: 212-503-5255; Advertising: 800 33 MAG AD, 212-503-

5100. *PC Magazine* is an independent journal, not affiliated in any way with International Business Machines Corp. IBM is a registered

trademark of International Business Machines Corp. Entire contents copyright ©1991 Ziff-Davis Publishing Company, a division of Ziff

Communications Company. All rights reserved; reproduction in whole or in part without permission is prohibited. The following are

registered trademarks of Ziff Communications Company: PC, *PC Magazine*, PC Labs, PC MagNet, PC Magazine Award for Technical

Excellence, PC Magazine Editors' Choice Award. The following are trademarks of Ziff Communications Company: Abort, Retry, Fail?;

Connectivity; Databases; Direct Marketing Connection; First Looks; New and Improved; Advisor; Lab Notes; PC Marketplace; Pipeline;

Tutor; The PC Utilities; Power Programming; Power User; Read Only; Spreadsheets; User-to-User; The Working Word.

SUBSCRIPTION INQUIRIES, ADDRESS CHANGES

Subscription Services: For subscription service questions, address changes, or ordering information, call toll-free 800-289-0429 in the U.S. and Canada; all other countries, call 303-447-9330. Or write to *PC Magazine*, P.O. Box 54093, Boulder, CO 80322-4093.

Subscription Rate: The subscription rate is \$44.97 for a 1-year subscription (22 issues). Canada and all other countries, please add an additional \$32.00 for postage. GST Registration Number: R-123669673.

Back Issues: For back issues (subject to availability), \$8 per issue (\$9 outside the U.S.), send check or money order to Back Issues Department, Ziff-Davis Publishing Company, P.O. Box 53131, Boulder, CO 80322-3131.

HOW TO CONTACT THE EDITORS

The editors of *PC Magazine* want to hear from you. Please send your questions, complaints, compliments, and submissions to *PC Magazine*, One Park Ave., New York, NY 10016. Send electronic mail to MCI Mailbox 157-9301 (*PC Magazine*) or PC MagNet (see below). *PC Magazine*'s general number is 212-503-5255. The West Coast Operations number is 415-378-5500. For other Ziff-Davis publications, call 212-503-3500.

We are unable to look up stories from past issues, recommend products, or diagnose problems with your PC by phone. If you bought a product advertised in *PC Magazine*, are dissatisfied, and can't resolve the problem, write (do not call) Alicia Dwek, Advertising Department at One Park Ave. Include copies of correspondence.

PC Magazine is under no obligation to review unsolicited products. All submissions accepted for publication become the property of *PC Magazine*. We will pay \$50 for Productivity user tips and Abort, Retry, Fail? submissions. For submissions to Abort, Retry, Fail?, if you send artwork for possible reproduction, mark the funny part on a photocopy, not the original.



PC MAGNET: PC MAGAZINE'S ON-LINE SERVICE

PC Magazine operates PC MagNet, an on-line service where readers can find the utilities published in each issue, download an index of reviews, share opinions with the editors, and access *Computer Library*. To join, set your communications software for either 300 or 1,200 bits per second, 7 data bits, even parity, 1 stop bit, and full duplex. To find the number nearest you, dial 800-346-3247. (In Canada, call 800-635-6225, voice only.) When the modem connects, press Enter. At the HOST NAME prompt, enter PHONES. Follow the menus and note the number closest to you.

After you have found the phone number, hang up and dial using the number you just found. When you connect with PC MagNet, press Ctrl-C. At the HOST NAME prompt, enter C1S. At the USER ID prompt, enter 177000,5000. Enter PC*MAGNET at the PASSWORD prompt and Z10D9000 at the ENTER AGREEMENT NUMBER prompt. CompuServe members can join by entering GO PCMAG at any CompuServe prompt. To upload a letter, type GO PCM:FORUMS. For Customer Service, call 800-848-8990. PC MagNet costs \$12.80 per hour via MasterCard, VISA, or American Express.

PERMISSIONS, REPRINTS

Material in this publication may not be reproduced in any form without permission. If you want to quote from an article or use *PC Magazine*'s logo in conjunction with an Editors' Choice designation, write Chantal Lavelanet; for information on reprints in quantities of 500 or more, write Claudia Crichlow.

PC MAGAZINE REVIEWS

Except where noted: All *PC Magazine* reviews are of currently available products. Comparative reviews are arranged alphabetically by product name for software, by company name for hardware. Software is free from copy protection. On benchmark test charts, shorter bars indicate faster products (less time to complete a task). Benchmark and performance tests are run on Compaq Deskpro 386/25s and 25es.



**AUSTIN
REVEALS THE
POWERFUL
SECRET BEHIND
ITS RAPID
SUCCESS.**



ARITH

YOU DON'T NEED AN MBA FROM HARVARD, MIT, OR EVEN THE UNIVERSITY OF SOUTHERN BURMA TO UNDERSTAND WHY AUSTIN COMPUTER SYSTEMS HAS BEEN SO SUCCESSFUL. ALL YOU HAVE TO DO IS COMPARE A DELL COMPUTER TO AN AUSTIN. **BESIDES NAME TAGS, THE BIG DIFFERENCE IS PRICE TAGS.**



AUSTIN COMPUTERS ARE DESIGNED AND ENGINEERED WITH THE HIGHEST QUALITY NAME BRAND COMPONENTS LIKE INTEL MICROPROCESSORS AND MICROSOFT ACCESSORIES. SO ARE DELL'S. AUSTIN HAS A FULL LINE OF PROCESSORS FROM 286'S TO 486/50'S. SO DOES DELL.

AUSTIN HAS NEXT-DAY ON-SITE SERVICE, TOLL-FREE PHONE SUPPORT, A 30-DAY MONEY-BACK GUARANTEE, SEPARATE VAR, CORPORATE AND INTERNATIONAL DEPARTMENTS, 100% FINANCING AND SEVERAL



METIC.

LEASE OPTIONS. DELL DOES TOO. BUT THE BIG DIFFERENCE IS DELL CHARGES YOU HUNDREDS, EVEN THOUSANDS OF DOLLARS MORE THAN AUSTIN. AND AS IF THAT ISN'T ENOUGH, AUSTIN GIVES YOU SOME



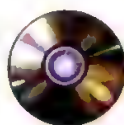
FEATURES DELL DOESN'T. LIKE HIGH-RESOLUTION, NON-INTERLACED

TO ORDER
CALL:

1-800-752-1577

MONITORS STANDARD ON

CD ROM FOR ONLY \$399



ALL COLOR SYSTEMS. THE OPTION OF A

ON ALL DESKTOP AND TOWER SYSTEMS.

**NON-INTERLACED
MONITORS**

AND 24-HOUR ACCESS TO OUR EXCLUSIVE ON-LINE ORDER ENTRY AND TRACKING SYSTEM VIA OUR NOV-

ELL NETWORK FOR ALL QUALIFIED BUYERS. WE'LL EVEN INSTALL YOUR OPERATING SYSTEM AND

APPLICATIONS SOFTWARE AT NO CHARGE.

AUSTIN COMPUTER SYSTEMS



IT ALL A

ALL THE EXTRAS NO EXTRA CHARGE AUSTIN WINSTATIONS COME COMPLETE WITH MS-DOS,

MICROSOFT WINDOWS 3.0, AND A MICROSOFT MOUSE. NOT SOME STRIPPED DOWN CHASSIS THAT'S AS USE-

FUL AS A PAPERWEIGHT. WE'LL EVEN CUSTOM BUILD YOUR SYSTEM. YOU PICK THE VIDEO, HARD DRIVE, RAM

SIZE, PERIPHERALS. **WHY THE EDITOR'S CHOICE SHOULD BE YOURS!** WE COULD GO ON FOREVER ABOUT

OUR FOUR EDITOR'S CHOICE AWARDS OR ABOUT HOW GREAT AUSTIN SYSTEMS ARE, BUT WE'LL LET

THE EXPERTS DO IT FOR US: "THE AUSTIN, TEXAS-BASED COMPUTER SELLER HAS GARNERED PC

MAGAZINE EDITOR'S CHOICES AS IF THE AWARD HAD BEEN CREATED FOR IT." PC MAGAZINE "TOP



NOTCH COMPONENTS, SOLID PERFORMANCE, TERRIFIC SUPPORT AND A LOW PRICE, MAKE IT A MACHINE

THAT IS HARD TO BEAT." PC MAGAZINE **WE MAKE HOUSE CALLS!** MOST COMPANIES BURN IN JUST THEIR

CPU'S. AT AUSTIN, WE BURN IN OUR SYSTEMS FULLY-CONFIGURED AS YOU ORDER THEM, SO THE CHANCE

OF NEEDING OUR G.E. ON-SITE SERVICE IS

LOCAL SUPERMARKET. BUT IF ANYTHING

WE'LL BE AT YOUR DOOR USUALLY WITHIN



ABOUT AS SLIM AS SPOTTING ELVIS IN YOUR

DOES GO WRONG DURING THE FIRST YEAR,

24 HOURS. YOU DON'T PAY FOR PARTS. OR

LABOR. OR EVEN THE CALL. WE ALSO OFFER EXTENDED SERVICE UP TO FIVE YEARS. AND OUR TOLL-FREE

TECHNICAL HOTLINE IS THERE FOR YOU IF YOU EVER NEED IT. **LEASE IT? FINANCE IT? DO IT?** NOT A ROCKE-

FELLER, GETTY, OR GATES? NO PROBLEM. YOUR BUSINESS CAN LEASE AN AUSTIN AT RATES EVEN A

TO ORDER CALL:

1-800-752-1577

VAR 1-800-338-1569 OVERSEAS (512) 339-3500
GOVT 1-800-833-4472 NETWORKING 1-800-874-7182
FAX (512) 454-1357 CANADA 1-800-338-1565
FORTUNE 1000 1-800-622-5506

TRUMP COULD AFFORD. OR YOU CAN APPLY FOR OUR LOW

INTEREST RATES, LOW PAYMENTS, AND 100% FINANCING.

MONEY-BACK GUARANTEE! TRY AN AUSTIN FOR 30 DAYS. IF

YOU'RE NOT ECSTATIC WITH IT, SHIP IT BACK. NO QUESTIONS ASKED.

ALL THIS SOUND GOOD? THEN CALL US NOW AT 1-800-752-1577 FOR OUR LATEST PRICES. OR CALL OUR

VAR, GOVERNMENT, CORPORATE, INTERNATIONAL, OR OUR



NETWORKING DEPARTMENTS AND WE'LL TELL YOU ABOUT OUR NEW VOLUME DISCOUNT PROGRAMS.

BECAUSE WHEN YOU ADD UP THE QUALITY, PERFORMANCE, SERVICE, MONEY-BACK GUARANTEE AND

COMPETITIVE PRICES YOU GET WITH AUSTIN, WE THINK YOU'LL AGREE WITH PC MAGAZINE

WHEN THEY SAID, "HOW CAN YOU LOSE?"

AUSTIN COMPUTER SYSTEMS



Microprocessor: 286 running at 16MHz
Storage: 40Mb IDE Hard Drive, 1 44 or 1 2 Mb FDD
Memory: 1 Mb RAM
Video: TTL Monochrome



Microprocessor: 386/SX running at 16MHz
Special Features: Pre-loaded with Microsoft Windows 3.0, MS-DOS and a Microsoft Mouse
Storage: 40Mb IDE Hard Drive, 1 44 or 1 2Mb FDD
Memory: 2Mb RAM
Video: TTL Monochrome



Microprocessor: 386/SX running at 20MHz
Special Features: Pre-loaded with Microsoft Windows 3.0, MS-DOS and a Microsoft Mouse
Storage: 40Mb IDE Hard Drive, 1 44 or 1 2Mb FDD
Memory: 2Mb RAM
Video: TTL Monochrome



Microprocessor: 386 running at 25MHz
Special Features: Pre-loaded with Microsoft Windows 3.0, MS-DOS and a Microsoft Mouse
Storage: 40Mb IDE Hard Drive, 1 44 or 1 2Mb FDD
Memory: 2Mb RAM
Video: TTL Monochrome



Microprocessor: 386/SX running at 25MHz
Special Features: 6 1/2 lbs. with battery. Battery and recharger included.
Storage: 60Mb IDE Hard Drive, 1.44Mb FDD
Memory: 1 Mb RAM
Video: 10" VGA LCD Display with 640 x 480 Resolution and 32-Gray Scale
Keyboard: Full size embedded numeric keypad with 12 function keys



Microprocessor: 386 running at 33MHz, 64K System Cache
Special Features: Pre-loaded with Microsoft Windows 3.0, MS-DOS and a Microsoft Mouse
Storage: 40 Mb IDE Hard Drive, 1.44 or 1.2Mb FDD
Memory: 2Mb RAM
Video: TTL Monochrome



Microprocessor: 486/SX running at 20MHz
Special Features: Pre-loaded with Microsoft Windows 3.0, MS-DOS and a Microsoft Mouse
Storage: 40 Mb IDE Hard Drive, 1.44 or 1.2Mb FDD
Memory: 2Mb RAM
Video: TTL Monochrome



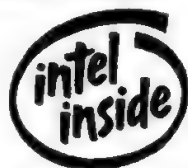
Microprocessor: 486 running at 33MHz
Special Features: Pre-loaded with Microsoft Windows 3.0, MS-DOS and a Microsoft Mouse
Storage: 40 Mb IDE Hard Drive, 1 44 or 1 2Mb FDD
Memory: 2Mb RAM
Video: TTL Monochrome



Microprocessor: 486 running at 33 MHz
Special Features: Pre-loaded with Microsoft Windows 3.0, MS-DOS and a Microsoft Mouse
Storage: 40 Mb IDE Hard Drive, 1.44 or 1.2 Mb FDD
Memory: 2Mb RAM
Video: TTL Monochrome



Microprocessor: 486 running at 50MHz
Special Features: Pre-loaded with Microsoft Windows 3.0, MS-DOS and a Microsoft Mouse
Storage: 40 Mb IDE Hard Drive, 1.44 or 1.2Mb FDD
Memory: 2Mb RAM
Video: TTL Monochrome
 Call for exact shipping date.



© 1997 Autodesk, Inc. Autodesk Systems All Rights Reserved. Autodesk reserves the right to alter product offerings and specifications at any time without notice, and is not responsible for typographical or graphical errors that appear in this document. © 1997 Autodesk, Inc. All rights reserved. Autodesk reserves the right to change product offerings and specifications at any time without notice, and is not responsible for typographical or graphical errors that appear in this document.

A615 (X) 012

CIRCLE 509 ON READER SERVICE CARD

We take pride in taking your call.



DUSTIN DELIVERS!

ACCOUNTING/FINANCE

ACC PAC BPI	255
DAC Accounting	95
DAC Bonus Pack	139
Managing Your Money	135
Master Accounting	99
Microsoft Money	55
Moneycounts	35
One Write + Complete	179
Pacciolli	39
Peachtree III	159
Peachtree III w/DQ	235
Quicken 5.0	49
Quicken Windows	49
Timeslips III	205
Turbo Tax	55
Turbo Tax Head Start '91	55
Winvoice	175

BORLAND

Borland C++	325
Objectvision	99
Paradox 3.5	529
Paradox Engine	99
Paradox Multipak	669
Paradox Upgrade	159
Quattro Pro 3.0	329
Quattro Pro 3.0 Upgrade	129
Sidekick 2.0	179
Sprint	65
Turbo C++ 2nd Edition	145
Turbo Debugger & Tools	75
Turbo Pascal 6.0	109
Turbo Pascal Windows	109
	169

BUSINESS GRAPHICS

3D Charts To Go	65
ABC Flowcharting	189
Calendar Creator Plus	55
Charisma 2.1	345
Dan Bricklin's Demo II	179
Draw Perfect	285
Easy Flow V70	169
Flowcharting III	149
Form Filler	95
Form Tool Gold 3.0	65
Freelance Graphics	349
Freelance Graphics For Windows	349
Freelance Graphics For Competitive Upgrade	99
Graph in the Box 2.2	79
Harvard Graphics 3.0	409
Hijaak	109
Hotshot Graphics	185
Impress 2L	85
Inset + Hijaak	149
Labels Unlimited	65
ORG Plus Advanced	69
Perform Professional	195
Presentation Team 2.0	339
Storyboard Live	289
Super Cartridge 3	309

CAD/DRAFTING

3D Drafting	219
Autosketch 3.0	159
Design CAD 5.0	185
Design CAD 3D	209
Drafix For Windows	445
Drafix Ultra	259
Generic CADD 5.0	299
TurboCAD	85

COMMUNICATION/NETWORKING

IBMmodem	55
Carbon Copy + 6.0	119

CO Session Windows

Crosstalk Communicator	65
Crosstalk Mk IV	145
Crosstalk Windows	129
Desklink	109
Dynacom Asynchronous	159
Fast Lynx	85
Laplink III	95
PC Anywhere IV	109
Procomm Plus 2.0	75
Reflections 4+	289
Smartcom Exec	79
Smartcom III	55
Smartterm 240	219
Softterm PC	129
WinConnect	69

DATABASE

Access SQL	429
Ask Sam 5.0	229
Biz'Base Personal	49
Business Contacts	45
Clanion Personal	55
Clanion Professional	489
Clipper 5.01	529
Codebase IV	265
Data Perfect 2.2	229
DB Fast Windows	229
DBase IV	519
DBase IV Developers	869
DBXL	149
Foxbase +	199
Foxbase + 386	305
Foxbase + Lan	305
Foxbase + Lan Runtime	349
Foxpro 2.0	485
Foxpro 2.0 LAN	789
Foxpro 2.0 Dist Kit	315
Nutshell+II	159
Paradox Engine	99
PC File 6.0	89
Personal R:Base	105
Q & A 4.0	269
Quicksilver	349
R Base 3.1	479
R&R Report Writer	159
SCO Foxbase	659
SQL Windows	899
Superbase 4	439
Thinx	319
WindowBase	149

DESKTOP PUBLISHING

Adobe Fonts	Call
Adobe Illustrator	319
Adobe Plus Pak	129
Adobe Streamline	249
Adobe TypeAlign	69
Adobe Type Manager	69
Adobe TypeSets 1,2,3	Call
Artline 2.0	389
Catchword	149
Corel Draw 2.0	389
Deluxe Paint II Enhanced	89
Designer	475
Express Publisher	105
Facelift	69
First Publisher	105
Fontasy 3	69
Freedom Of The Press	259
Graphics Composer	265
Graphics Editor	395
Graphic 4.0	205
Image-In-Color	469
Microsoft Publisher For Windows	139
OmniPage 386 Windows	469

Pagemaker 4.0

PC Paintbrush IV +	519
Pizazz +	125
Printmaster Plus	75
Printshop	45
Publish It 2.0	149
Publishers Type Foundry	319
Readright Windows	319
Show Partner F/X	229
Soft Type	125
The Animator	309
Ultra Script PC Plus	259
Ventura Gold 3.0	499
Windows Draw	Call

EDUCATION TRAINING

French Assistant	49
German Assistant	49
Italian Assistant	49
Learning DOS	45
Learning German	95
Learning Spanish	95
PC Bible Study	89
Spanish Assistant	49
Teach Yourself	39
Windows 3.0	39
Where is Carmen?	39

HARDWARE

AC Datalink	309
Hayes ESP PS/2	265
Hayes ESP AT/XT	229
Okidata Printers	Call
Optima 96 V32	505
Pocket Edition 2400	135
Toshiba Laptops	Call

INFORMATION/PROJECT MANAGEMENT

ACT	235
Address Book Plus	59
Agenda 2.0	305
BCIM	49
BCIM For Windows	75
Current	235
Desktop Set 3	95
First ACT	Call
Grandview	205
Harvard Project Manager	459
Idea Fisher	359
Info Select 2.0	55
Maxthink	55
On Target	275
Plan Perfect	245
Project Scheduler V	495
Sidekick 2.0	65
Timeline 5.0	465
Who-What-When	185
WP Office 5 Pack	309

INTEGRATED

First Choice	105
Framework III	465
Lotus Works	99
Microsoft Works For Windows	139
Open Access III	409
Smartware II	469
Smart System Xenix	919
Symphony 2.2	525
Word Perfect Office	95

KENSINGTON

Expert Mouse	109
Keyboard Shelf	55
Masterpiece+	115

MATHEMATICAL

Derive	159
--------	-----

Mathematica 386 2.0

Mathematica 386/387	875
Mathcad Windows	789
Math Type PC	319
SPSS/PC +	175
Statgraphics 5.0	179
Sigma Plot	635
Systat Dual	479
Plot It	755
	359

MICROSOFT

MS Basic 7.1	339
MS C Compiler	335
MS Chart	269
MS Dos 3.3 or 4.01	79
MS DOS 5.0	79
MS DOS 5.0 Upgrade	69
MS Excel 3.0	319
MS Fortran	309
MS Macro Assembler	109
MS Mouse with Paint	115
MS Mouse with Windows	165
MS Multiplan	135
MS Office Windows	499
MS Project	339
MS Project Windows	465
MS Quick Basic	75
MS Quick C	75
MS Windows 3.0	99
MS Windows Dev Toolkit	339
MS Word 5.5	229
MS Word Windows	329

OPERATING SYSTEMS

Desqview	85
Desqview 386	139
Double DOS	49
DR DOS 6.0	75
DR DOS Multi-User	459
Gnoworks	129
MS DOS 5.0	79
MS DOS 5.0 Upgrade	69
OS/2 Pres Mgr Toolkit	339
OS/2 Standard	145
PC DOS 3.3	129
PC DOS 4.01	139
PC DOS 5.0	155
PC MOS 5.0 User	445
Unix 386 Development	709
Unix 386 Operating	709
VM 386 Multi-User	589
Xenix 386 Operating	589

PROGRAMMING

Actor	99
Actor Professional	485
APL Plus	449
Brief	185
Case PM	1859
Clear + For C	135
Halo 88 MS C	259
Owl Guide/Windows	389
Realizer	369
RM Cobol 85	789
Smalltalk V286	125
Smalltalk VPM	299
Smalltalk Windows	279
Toolbook Windows	305
Turbo C Tools	125
Turbo Professional UI Programmer	109
	345

SPREADSHEETS

Baler	365
Lotus 123 ver. 2.3	349
Lotus 123 V. 3.1+	419
MS Excel 3.0	319
Quattro SE	75

THE DUSTIN DIFFERENCE:

- ✓ Free Ground Shipping
- ✓ Same Day Shipping
- ✓ Overnight Delivery Available
- ✓ Corporate PO's Welcome
- ✓ APO's & FPO's Welcome
- ✓ 24-Hour FAX Order-Line
- ✓ Government & Educational Pricing
- ✓ No Minimum Orders
- ✓ Visa, MasterCard, & AMEX Accepted
- ✓ No Credit Card Charges Until Shipping
- ✓ No Credit Card Surcharges
- ✓ Thousands of Items in Stock
- ✓ The Latest Software Versions for your PC
- ✓ Manufacturers' Warranties & Documentation
- ✓ Call for Items Not Listed & Free Catalogue

Quattro 3.0	319	P Link 86	289
Quattro 3.0 Upgrade	129	PC Kwik Powerpack	79
Supercalc V	109	PC Tools Deluxe 7.1	109
Wingz PC	335	PK Zip	49
		PackRat	255
UTILITIES		Pop Drop Plus	65
386 Max 6.0	69	Print A Plot	195
Above Disk	65	Print Cache	115
Allways	129	Print Q	89
AutoMap	59	Publishers Power Pak	55
Auto Menu	45	Q Dos III	55
Becker Tools	89	QEMM 386 6.0	69
Blue Max 6.0	85	QRAM	55
Brooklyn Bridge	95	Resource Toolkit	115
Check It	89	Scrapbook+	95
Command Post	49	Sideways	65
Control Room	635	Software Bridge	85
Copy II PC	35	SPF/PC	155
Copywrite	65	Spinrite	89
Cubit	45	Switch It	55
Direct Access	69	Turbo EMS	59
Disk Manager	45	V Feature Deluxe	85
Disk Technician Gold	99	Virex PC	85
Fastback Plus 3.0	119	Windows Express	65
First Apps	59	Wonder Plus	55
Headroom	75	XTree Gold 2.5	99
Icon Designer	45		
Info Spotter	55	WORD PROCESSING	
Intelligent Back-Up	109	AmiPro	299
K Edit	115	AmiPro Upgrade	99
Mace 1990	99	Grammatik IV	65
Magellan	115	Just Write	85
Memory Commander	59	Letter Perfect	145
Menu Works	25	Manuscript	339
MKS Toolkit	225	Multimate 4.0	269
Mover	59	Nota Bene	339
Netsroom	59	Professional Write+	175
Norton Back-Up	95	Rightwriter 5.0	65
Norton Commander	99	Typing Tutor IV	35
Norton Desktop w/Game Pak	109	Word For Word Pro	79
Norton Editor	75	Word Perfect 5.1	259
Norton Utilities 6.01	119	Word Perfect Windows	279
Option Board Deluxe	119	Wordstar 6.0	225



**Plain Wrap Prices,
Black Tie Service.**

20969 Ventura Blvd., Suite #13, Woodland Hills, CA 91364 (818) 710-9174
**Call Toll Free from anywhere in the United States
 Monday thru Friday - 6:00AM to 5:00PM PST**

1-800-274-6611

Or Fax Us

1-818-884-5310

We will promptly replace any defective items returned within 30 days, but cannot guarantee compatibility. There is a 15% restocking fee on any non-defective, unopened goods, and all returns must be accompanied by a Returned Merchandise Authorization. Software prices do sometimes fluctuate beyond our control and may change, for better or worse, without notice. While ground shipments are free, we do ask \$11.00 per item for 2-day, \$22.00 per item for overnight, and \$4.50 for C.O.D. Although shipping heavier items may be slightly more, bulk orders can be a lot less. Free catalogues are available upon request, and please call us for any item not listed.

Letters

BULLETIN BOARD BUSINESS

Few topics have generated as much reader response as communications hardware and software. Here is a sample of letters in response to "Tools for Wide-Area Communications: Bulletin Board Software," our review of ten BBS programs (September 10, 1991).

Your review of our product, *The Major BBS*, was poorly done. Reviewer Joe Salemi made inaccurate and misleading statements that indicate a hasty and superficial approach to the product and the review itself. He refers to our security as "weak." A reader could easily get the impression that *The Major BBS* is hackable and that unauthorized access to various files or features can be easily obtained. What he meant to say is that he does not consider our security system flexible. In support of this, he says that we support only eight security levels per SIG (special interest group), independently settable on each of up to 200 SIGs. This means there are 600 bits of security information stored per user, or up to 2⁶⁰⁰ security levels available.

Salemi also says that *The Major BBS* is difficult to configure and that only a "two-line on-screen window" of information about each configuration option is available. Apparently, he missed the Help key, F1, which is clearly labeled. F1 brings up a detailed discussion of each configuration option, including examples, charts, and cross-references where appropriate.

In conclusion, Version 5.30 of *The Major BBS*, which is now shipping, has full *NetWare* support.

Tim Stryker
Chairman, Galacticomm
Fort Lauderdale, Florida

To suggest weak overall security in *The Major BBS* based in part on a numerical disadvantage (supposedly only eight levels on SIG and Library Access versus up to 50,000 by some other vendors) is ridiculous. Apparently, Mr. Salemi does not



Our BBS software story evoked strong feelings from our readers.

understand the difference between system security, module or level access, and rights associated with a user ID at the menu level: None-no access, Read only, Read/Write, Read/Write/Upload, etc. *The Major BBS* is a product that has a high degree of product flexibility while ensuring protection against all unauthorized access.

James E. Appleby
President, The Business BBS
Los Angeles, California



The issue of security levels is a volatile one, and a better word to describe *The Major BBS*'s security system would have been "limited" or "inflexible" rather than "weak." However, Mr. Stryker's contention that there are 2⁶⁰⁰ security levels is specious—virtually every package we tested allows the sysop to set the user's security level per SIG, so the same math applies to all of them. As part of our testing process, we installed *The Major BBS* at least three times and never saw any references to a Help key on-screen or in the manual. We regret the error.—Ed.

You made no mention of one of the most important developments in BBS software, the off-line reader. Best known is *QMail* by Mark Herring of Memphis, Tennessee. *QMail*'s .QWK format is now supported on a number of BBSs. By using *QMail* or one of its competitors, such as *Markmail* by Mark Turner or *Rose Mail* by Rose Media, a PC Board user is able to download a packet of messages from the BBS in short order. By utilizing a companion reader program (there are several available), a user can browse through messages at his leisure in an environment that re-creates the PC Board BBS in many ways. On his next call, the user uploads the messages he created off-line. It's a great way for users to fully utilize a BBS with minimal connect time.

Ed Hopper
Sysop, Ed Hopper's BBS
Pearland, Texas

Thank you for the thorough article on BBS software and your willingness to consider *RBBS-PC* for review. The fact that we chose to give away our software scares some, but your Editors' Choice award will help us prove that good software isn't always expensive.

Just a few points: Our new phone number is 407-487-3441. This number is available to anyone who wishes to see or download *RBBS-PC*. You also reported that *RBBS-PC* does not specifically support *Novell NetWare*, but we do. When a sysop selects *NetBIOS*, *RBBS-PC* will check to see if it is *NetWare*. If so, *RBBS-PC* invokes *NetWare*-specific code when needed (to set access rights on new uploads, for example). The sysop doesn't have to configure anything, because *RBBS-PC* can sense *NetWare* automatically.

Doug Azzarito
Coauthor, *RBBS-PC*
Boca Raton, Florida

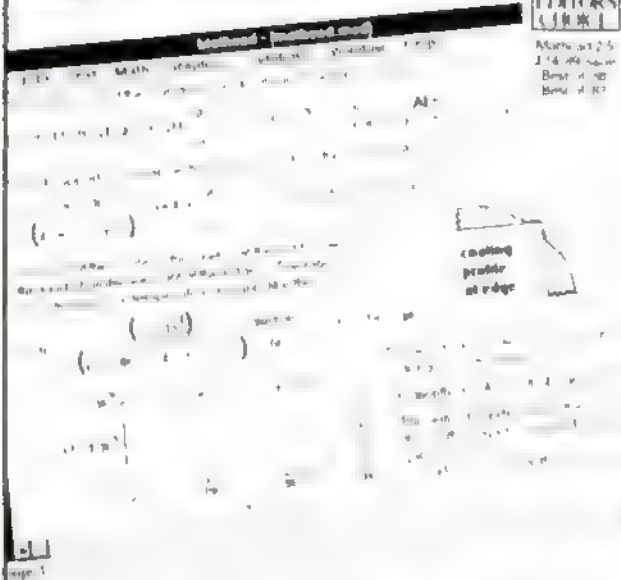
With respect to LAN operation of the *Wildcat!* BBS, I can't imagine what

Technical calculations made easy!

ALL NEW VERSION 3.0!



Mathcad 3.0
1 1/4" disk
Box 100
Bent 4.00



Now it's easier than ever to perform faster, more reliable engineering and scientific calculations.

- **Windows graphics features make Mathcad 3.0 the simple solution to complex analytic needs.** Dialogs, pull-down menus and mouse point-and-click capabilities make it easy to combine equations, text, and graphics right on your screen and print it all in a presentation-quality document
- **New Electronic Handbook Help facility serves as an on-line reference library.** Paste standard formulas, constants, and diagrams from searchable, hypertext Electronic Handbooks for instant use in your Mathcad worksheet
- **Symbolic calculations with a simple menu pick.** Use expressions resulting from symbolic derivations in your numeric calculations or for further symbolic manipulation
- **Mathcad works on PC DOS, PC Windows, Macintosh, or UNIX.** More than 120,000 engineers, scientists, and educators already use Mathcad for a variety of technical applications. Applications packs are also available to customize Mathcad for particular disciplines, including electrical, mechanical, and civil engineering and advanced math

Call 800-MATHCAD or use this coupon to request a free 3.0 demo disk!

In Massachusetts, call 617-577-1017. Please specify diskette size:

3 1/2" 5 1/4"

For a free Mathcad 3.0 Introductory kit, clip this coupon and mail it back to us, or fax it to 617-577-8829. Or circle your reader service card.

Yes! Tell me more about Mathcad 3.0!

Name _____
Title _____
Company or Institution _____
Address _____
City _____ State _____ Zip _____
Phone (____) _____

MathSoft

Mail this coupon to
MathSoft, Inc.
201 Broadway
Cambridge, MA 02139
USA

PCM TECH 3.0

Letters

prompted Mr. Salemi to take issue with the fact that users need to sign on through the main system screen. With a copy of the program running on a workstation, pressing Alt-L prompts the user for a name and a password, just as if they had logged in via modem. Would you want a BBS in a corporate environment to allow access to *your* account—and your personal mail—to anyone who has access to your workstation in your absence? Then why complain that needing to enter a name and a password "limits *Wildcat!*'s usefulness as an in-house messaging or mail system?" It does nothing of the kind.

Jerry Houston
Kirkland, Washington



Concerning LAN usage, what we were looking for was the ability to log in directly from the command line, so that the BBS program can be started from a batch file, without the user having to enter more than his or her user ID or password. We have since found out that the version we tested supports this, though it was undocumented.—Ed.

Your BBS review of Galacticom was almost as bad as Spiro Agnew calling "Puff the Magic Dragon" a drug song! I've been running *The Major BBS* (the Celebration Station, 207-374-2303) for more than five years and am increasingly pleased with the manner in which Galacticom has empowered the sysop to make all changes through its multilevel menued software. *The Major BBS* configuration is only as complex as the sysop's capability to respond to menus.

An ever-increasing number of sysops and I agree: Galacticom's *The Major BBS* is the best-supported and most easily installed true multiuser electronic bulletin board.

Noel Paul Stookey
Sysop, Celebration Station BBS
Blue Hill Falls, Maine

Stookey is the Paul of the musical group Peter, Paul, and Mary.—Ed.

Joe Salemi's review of *The Major BBS* from Galacticom glossed over its most important feature: extensibility. Galacticom is the only company that provides C source code for its product, and the result

is that there is a thriving aftermarket for *The Major BBS* add-on software.

Dan Hanson
Sherwood Park, Alberta, Canada



Galacticom is not unique in providing the source code to its package; some of the other packages reviewed provide their source code and system file structures for free, or will assist third-party vendors in creating utilities for their products. Except for the three native multitasking packages, all of the BBSs reviewed here have the ability to run external programs through a door-type function.—Ed.

Your BBS software review barely scratched the surface. You missed: *Bernie Host*, Version 1.0, by Bernie Gallagher; *Magpie*, Version 2.0, by Steve Manes; *TAG*, Version 2.5, by Robert Numerick and Victor Caption; and *WWIV*, Version 4.11, by Wayne Bell.

Primitive BBS programs, such as *RBBS-PC*, tack new messages on at the end of the file and retrieve them in chronological order. A recent trend, however, is a tree-structured message base where each reply hangs off the message that spawned it. All messages are read by walking the message base like a binary tree.

Jesse Duquesne
Piscataway, New Jersey



The criteria we used to select the software are listed on page 241 of the September 10, 1991, issue.

After our BBS review was completed, we learned that the *Gap Communications Online Software* (Gap Development Co., 24242 Porto Fino, Monarch Beach, CA 96277; 714-946-3774) has PCRelay UTI drivers available, which would have made it eligible for inclusion. We regret the oversight.—Ed.



AMIGA OR ATARI?

As an Amiga user, I'm always pleased to see my favorite computer platform mentioned in a "mainstream" PC magazine such as yours, even when it is in error. John C. Dvorak (Inside Track, October 15, 1991) refers to Digital Research's *GEM* as "the decrepit but interesting...operating system used on the Amiga."

Ahem. *GEM* isn't an operating system but a GUI (*GEM* is an acronym for Graphical Environment Manager). Second, the Amiga doesn't use it. Perhaps Dvorak was thinking of the Atari ST series, which does

300 *dpi*

&

600 *dpi*



QMS introduces a PostScript printer of extremely strong character.

The new QMS-PS[®] 815 MR[™] print system gives you 300 x 300 dpi and true 600 x 600 dpi Adobe[®] PostScript[®] printing at your fingertips. Extremely sharp, crisp characters, fine line detail and clear halftones make this the reliable, affordable eight-page-per-minute printer you're after. See how the following features plus QMS National Service and free technical support will keep your 815 MR (and you) looking sharp.

- True 600 x 600 dpi delivers four times the gray levels as 300 x 300 dpi for clear halftones
- Connects to IBM[®] or compatible computers, Apple[®] Macintosh[®] computers & most mini computers & mainframes simultaneously
- Automatically switches to 300 x 300 dpi mode when needed for HP[®] applications
- Interprets incoming printer language (HP or PostScript) and switches automatically

For more information on the QMS-PS 815 MR, or on any other QMS[®] PostScript printer, call today. Or Fax QMS Product Information at 205-633-4866.

1 800 GET HI-RES EXT. 35
1 800 438-4473

QMS 
Where Imagination Leads

The following are trademarks or registered trademarks of their respective companies: QMS, QMS-PS, MR and the QMS logo of QMS, Inc. Adobe, PostScript, and the PostScript logo of Adobe Systems, Inc. IBM of International Business Machines Corp. Apple and Macintosh of Apple Computer, Inc. HP of Hewlett-Packard Company.

CIRCLE 259 ON READER SERVICE CARD

America's Favorite 486™

486 Technology – Made Affordable!

Intel's 486 processor represents the most **highly advanced PC** technology available today. And Tri-Star's 13MHz 486 Flash Cache systems make that technology **highly affordable**. You can now own a fully loaded Flash Cache 486 from Tri-Star for only \$2995. That's hundreds less than some companies sell a comparably equipped 386 system! Why pay more for less?

Do yourself a favor, buy the best. Tri-Star builds America's favorite 486. We've built more 486 computers than most companies have built PC's. We're committed to offering the best 486 systems available anywhere, at any price. At only \$2995, can you really afford not to own a new 486.

P. 92

PER WEEK / MONTH

$$F = (24.4, 0.07) \quad \text{at } 5\% \text{ level}$$


WELL LABS
Prospect Review

Tri-Star Leads 33MHz 486 PC Pack

Eight Low-Cost Systems Perform Well; Video and Hard-Disk Components Va-

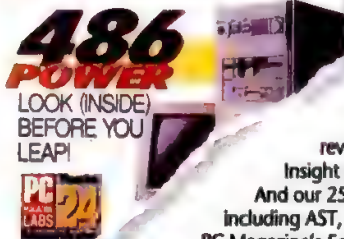
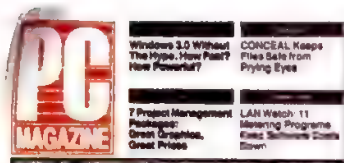
By David Claiborne

It is not a "new" concept, but it is a concept that has been used by the state of

1. Die Funktion $f: \mathbb{R} \rightarrow \mathbb{R}$ ist durch $f(x) = x^2 + 2x - 3$ gegeben.
 a) Skizze des Graphen von f .
 b) Bestimmung der Nullstellen von f .
 c) Bestimmung des Minimums von f .
 d) Bestimmung des Wertebereichs von f .
 e) Bestimmung der Ableitung $f'(x)$.
 f) Bestimmung der Ableitung $f''(x)$.
 g) Bestimmung der Ableitung $f'''(x)$.
 h) Bestimmung der Ableitung $f^{(4)}(x)$.
 i) Bestimmung der Ableitung $f^{(5)}(x)$.
 j) Bestimmung der Ableitung $f^{(6)}(x)$.
 k) Bestimmung der Ableitung $f^{(7)}(x)$.
 l) Bestimmung der Ableitung $f^{(8)}(x)$.
 m) Bestimmung der Ableitung $f^{(9)}(x)$.
 n) Bestimmung der Ableitung $f^{(10)}(x)$.
 o) Bestimmung der Ableitung $f^{(11)}(x)$.
 p) Bestimmung der Ableitung $f^{(12)}(x)$.
 q) Bestimmung der Ableitung $f^{(13)}(x)$.
 r) Bestimmung der Ableitung $f^{(14)}(x)$.
 s) Bestimmung der Ableitung $f^{(15)}(x)$.
 t) Bestimmung der Ableitung $f^{(16)}(x)$.
 u) Bestimmung der Ableitung $f^{(17)}(x)$.
 v) Bestimmung der Ableitung $f^{(18)}(x)$.
 w) Bestimmung der Ableitung $f^{(19)}(x)$.
 x) Bestimmung der Ableitung $f^{(20)}(x)$.
 y) Bestimmung der Ableitung $f^{(21)}(x)$.
 z) Bestimmung der Ableitung $f^{(22)}(x)$.
 aa) Bestimmung der Ableitung $f^{(23)}(x)$.
 ab) Bestimmung der Ableitung $f^{(24)}(x)$.
 ac) Bestimmung der Ableitung $f^{(25)}(x)$.
 ad) Bestimmung der Ableitung $f^{(26)}(x)$.
 ae) Bestimmung der Ableitung $f^{(27)}(x)$.
 af) Bestimmung der Ableitung $f^{(28)}(x)$.
 ag) Bestimmung der Ableitung $f^{(29)}(x)$.
 ah) Bestimmung der Ableitung $f^{(30)}(x)$.
 ai) Bestimmung der Ableitung $f^{(31)}(x)$.
 aj) Bestimmung der Ableitung $f^{(32)}(x)$.
 ak) Bestimmung der Ableitung $f^{(33)}(x)$.
 al) Bestimmung der Ableitung $f^{(34)}(x)$.
 am) Bestimmung der Ableitung $f^{(35)}(x)$.
 an) Bestimmung der Ableitung $f^{(36)}(x)$.
 ao) Bestimmung der Ableitung $f^{(37)}(x)$.
 ap) Bestimmung der Ableitung $f^{(38)}(x)$.
 aq) Bestimmung der Ableitung $f^{(39)}(x)$.
 ar) Bestimmung der Ableitung $f^{(40)}(x)$.
 as) Bestimmung der Ableitung $f^{(41)}(x)$.
 at) Bestimmung der Ableitung $f^{(42)}(x)$.
 au) Bestimmung der Ableitung $f^{(43)}(x)$.
 av) Bestimmung der Ableitung $f^{(44)}(x)$.
 aw) Bestimmung der Ableitung $f^{(45)}(x)$.
 ax) Bestimmung der Ableitung $f^{(46)}(x)$.
 ay) Bestimmung der Ableitung $f^{(47)}(x)$.
 az) Bestimmung der Ableitung $f^{(48)}(x)$.
 ba) Bestimmung der Ableitung $f^{(49)}(x)$.
 bb) Bestimmung der Ableitung $f^{(50)}(x)$.
 bc) Bestimmung der Ableitung $f^{(51)}(x)$.
 bd) Bestimmung der Ableitung $f^{(52)}(x)$.
 be) Bestimmung der Ableitung $f^{(53)}(x)$.
 bf) Bestimmung der Ableitung $f^{(54)}(x)$.
 bg) Bestimmung der Ableitung $f^{(55)}(x)$.
 bh) Bestimmung der Ableitung $f^{(56)}(x)$.
 bi) Bestimmung der Ableitung $f^{(57)}(x)$.
 bj) Bestimmung der Ableitung $f^{(58)}(x)$.
 bk) Bestimmung der Ableitung $f^{(59)}(x)$.
 bl) Bestimmung der Ableitung $f^{(60)}(x)$.
 bm) Bestimmung der Ableitung $f^{(61)}(x)$.
 bn) Bestimmung der Ableitung $f^{(62)}(x)$.
 bo) Bestimmung der Ableitung $f^{(63)}(x)$.
 bp) Bestimmung der Ableitung $f^{(64)}(x)$.
 bq) Bestimmung der Ableitung $f^{(65)}(x)$.
 br) Bestimmung der Ableitung $f^{(66)}(x)$.
 bs) Bestimmung der Ableitung $f^{(67)}(x)$.
 bt) Bestimmung der Ableitung $f^{(68)}(x)$.
 bu) Bestimmung der Ableitung $f^{(69)}(x)$.
 bv) Bestimmung der Ableitung $f^{(70)}(x)$.
 bw) Bestimmung der Ableitung $f^{(71)}(x)$.
 bx) Bestimmung der Ableitung $f^{(72)}(x)$.
 by) Bestimmung der Ableitung $f^{(73)}(x)$.
 bz) Bestimmung der Ableitung $f^{(74)}(x)$.
 ca) Bestimmung der Ableitung $f^{(75)}(x)$.
 cb) Bestimmung der Ableitung $f^{(76)}(x)$.
 cc) Bestimmung der Ableitung $f^{(77)}(x)$.
 cd) Bestimmung der Ableitung $f^{(78)}(x)$.
 ce) Bestimmung der Ableitung $f^{(79)}(x)$.
 cf) Bestimmung der Ableitung $f^{(80)}(x)$.
 cg) Bestimmung der Ableitung $f^{(81)}(x)$.
 ch) Bestimmung der Ableitung $f^{(82)}(x)$.
 ci) Bestimmung der Ableitung $f^{(83)}(x)$.
 cj) Bestimmung der Ableitung $f^{(84)}(x)$.
 ck) Bestimmung der Ableitung $f^{(85)}(x)$.
 cl) Bestimmung der Ableitung $f^{(86)}(x)$.
 cm) Bestimmung der Ableitung $f^{(87)}(x)$.
 cn) Bestimmung der Ableitung $f^{(88)}(x)$.
 co) Bestimmung der Ableitung $f^{(89)}(x)$.
 cp) Bestimmung der Ableitung $f^{(90)}(x)$.
 cq) Bestimmung der Ableitung $f^{(91)}(x)$.
 cr) Bestimmung der Ableitung $f^{(92)}(x)$.
 cs) Bestimmung der Ableitung $f^{(93)}(x)$.
 ct) Bestimmung der Ableitung $f^{(94)}(x)$.
 cu) Bestimmung der Ableitung $f^{(95)}(x)$.
 cv) Bestimmung der Ableitung $f^{(96)}(x)$.
 cw) Bestimmung der Ableitung $f^{(97)}(x)$.
 cx) Bestimmung der Ableitung $f^{(98)}(x)$.
 cy) Bestimmung der Ableitung $f^{(99)}(x)$.
 cz) Bestimmung der Ableitung $f^{(100)}(x)$.

"Tri-Star Computer Corporation's Flash Cache 486/33 includes extras in disk capacity, RAM capacity, internal expansion options and service that make it stand out among the test set. All this for less than \$5000, (now less than \$3000!) with a two year parts and labor warranty makes the Flash Cache 486/33 PC Week Lab's analyst Choice."

PH WEEK
ANALYST'S CHOICE



**HONORABLE
MENTION**

Our 33MHz 486 Flash Cache topped every other 33MHz computer system reviewed including EPS, Tangent, PC Brand, and Insight to win PC Week's Analyst Choice Award. And our 25MHz Flash Cache 486 topped 22 others including AST, CompuAdd, Everex, and Gateway to become PC Magazine's Editor's Choice runner up.

FLASH CACHE
486 33MHz ISA

Intel 80486 33MHz Processor with Integrated
8K Cache & 487 Math Coprocessor
8MB of High Speed 32-Bit RAM (expandable to 64MB on-board)
64K of Secondary Static RAM Cache
(expandable to 256K)

210MB 15ms Hard Disk Drive with 64K Cache Buffer

1.2MB Teac 5.25-inch Floppy Disk Drive

1.44MB Teac 3.5-inch Floppy Disk Drive

1MB High Color 1024x768 SVGA Graphics Adapter

14" Non-Interlaced .28mm SVGA Color Display

Two Serial Ports & One Parallel Port

Microsoft DOS 5.0 & Windows 3.0

High Res 400 DPI Three Button Mouse

Quality 101-Key Tactile Keyboard

\$9995

\$2995

\$2500

LEASE \$107/MONTH

17" & 21" FLAT SCREEN
COLOR DISPLAYS AVAILABLE

COMPLETE LINE OF
MASS STORAGE UPGRADES
AVAILABLE - CALL TODAY.





FLASH CACHE 486 33MHZ EISA

Intel EISA True 32-Bit Bus Architecture
Intel 80486 33MHz Processor with Integrated
8K Cache & 487 Math Coprocessor
8MB of High Speed 32-Bit RAM (expandable to 64MB on-board)
256K of Secondary Static RAM Cache
EISA SCSI True 32-Bit Hard Drive Controller
340MB 15ms SCSI Hard Drive with 128K Cache Buffer
1.2MB Teac 5.25-inch Floppy Disk Drive
1.44MB Teac 3.5-inch Floppy Disk Drive
1MB High Color 1024x768 SVGA Graphics Adapter
14" Non-Interlaced .28mm SVGA Color Display
Two Serial Ports & One Parallel Port
Microsoft DOS 5.0 & Windows 3.0
High Res 400 DPI Three Button Mouse
Quality 101-Key Tactile Keyboard

\$3995

LEASE \$141/MONTH

TRI-CAD 486 33MHZ EISA

Intel EISA True 32-Bit Bus Architecture
Intel 80486 33MHz Processor with Integrated
8K Cache & 487 Math Coprocessor
8MB of High Speed 32-Bit RAM (expandable to 64MB on-board)
256K of Secondary Static RAM Cache
EISA SCSI True 32-Bit Hard Drive Controller
340MB 15ms SCSI Hard Drive with 128K Cache Buffer
1.2MB Teac 5.25-inch Floppy Disk Drive
1.44MB Teac 3.5-inch Floppy Disk Drive
1MB High Color 1024x768 SVGA Graphics Adapter
17" Flat Screen Non-Interlaced SVGA Color Display
12"x12" Digitizer with 16 Button Cursor
Panacea ACAD DLD Driver
Two Serial Ports & One Parallel Port
Microsoft DOS 5.0
Quality 101-Key Tactile Keyboard

\$4995

LEASE \$175/MONTH



With

from AutoCAD

AutoCAD 7.0

AutoCAD 7.0

AutoCAD 7.0

AutoCAD 7.0

AutoCAD 7.0

AutoCAD 7.0

AutoCAD 7.0

AutoCAD 7.0

AutoCAD 7.0

AutoCAD 7.0

AutoCAD 7.0

AutoCAD 7.0

AutoCAD 7.0

AutoCAD 7.0

AutoCAD 7.0

THE RIGHT VALUE

TRI-STAR
COMPUTER CORPORATION

1.800.678-2799

TECH SUPPORT 1.800.688-8324

FAX 602.961-4010

INTERNATIONAL 602.961-3401

Hours: 9am-7pm, PST Mon-Fri, 8am-4pm, Sat
120 South Weber, Chandler, Arizona 85226

Two Year Parts Warranty • 60 Day Money Back
Guarantee • Lifetime Toll-Free Technical Support •
One Year On-Site Service • Lifetime Free Our-Site
Labor • One Year Overnight Parts Replacement

All prices and specifications subject to change without notice. Tri-Star cannot be responsible for errors in typographical or photographic reproduction. Please payment based on 15 months, open-end lease. On-site service may not be available in some remote locations. 60 day money back guarantee does not include shipping and handling charges. 2 Year parts warranty includes system, keyboard, and display. Monitor is covered for one year. AutoCAD is a registered trademark of Autodesk, Inc. Intel is a registered trademark of Intel Corporation. All other company names are trademarks or trademarks of their respective company.

The screenshot shows the Windows 95 desktop environment. At the top is the taskbar with the menu bar (File, Disk, View, Configure, Tools, Window, Help) and the Start button. The desktop background is a blue gradient with icons for 'A' (floppy disk), 'B' (floppy disk), 'C' (floppy disk), 'P Home', 'bluesky.xls', and 'Accessories'. A file explorer window is open, displaying the contents of the 'C:\EXCEL\EXCEL\CHT*' directory. It shows a list of files and folders, including 'book', 'demos', 'document', 'jobdescp', 'memos', 'notes', 'preds', 'excel', and 'excelcbl'. A file named 'budget91' is selected. Below the file explorer is an Excel spreadsheet titled 'Blue Sky Air Seasonal Ticket Sales'. The spreadsheet has columns A through F and rows 1 through 5. The data in the spreadsheet is as follows:

	A	B	C	D	E	F
1	Blue Sky Air	Seasonal Ticket Sales				
2		July	Aug	Nov		
3	Portland	\$6,825	\$6,354	\$5,275		
4	Bend	\$4,260	\$4,460	\$7,860		
5						

An 'Applications' menu is open, showing a list of applications including 'Paint', 'FontStyle', 'On Target', 'Calculator', 'Accessories', 'Mail', 'Control Panel', 'Excel', 'Internet Explorer', and 'JustWrite'. The 'Accessories' icon is highlighted.

A portrait of a young man with short, light-colored hair and glasses. He is wearing a light-colored, possibly yellow or cream, button-down shirt with a dark tie. His arms are crossed over his chest. The background is a mottled, dark color. The image has a slightly grainy, vintage quality.

And The Norton Desktop provides the easiest UnErase™ ever, for stand-alone PCs and network systems, plus the industry's most powerful automatic disk diagnosis.

It also includes a rich assortment of screen savers, along with our SuperFind™ text searching, enabling you to quickly search and find files on any disk drive—even on networks.

So if you're ready to improve your Windows, visit your nearest dealer or call **1-800-343-4714, Ext. 722P** for more information about the Norton Desktop. It could be the best thing that ever happened to your PC.

Now you can make Windows perform the way you've always wanted—without changing the way you use it. Because The Norton Desktop is the perfect companion for Windows.

For starters, you can move your programs and file groups from the confinement of the Windows Program Manager to the freedom of The Norton Desktop. It's like having your file manager and program manager transparently integrated—all for just \$149*!

***"We took one look at
The Norton Desktop for Windows,
and it instantly became the
way we'll compute in Windows
from now on."***

the more than 150 icons provided, while The Norton Viewer enables you to instantly view files from over 30 Windows and DOS applications.



Norton Backup

Not only does the Norton Desktop make sure your files are well managed, it also ensures they're well protected.

We've included The Norton Backup™ for Windows,** one of the fastest, most reliable backups you can buy. You can easily set-up automatic backups for any time of the day or night, whether you're present or not, and backup in the background, even to and from network drives.



* Suggested retail price, USA only. ** Also available separately for \$129 (MSRP). © 1991 Symantec Corporation. All rights reserved. The Norton Desktop for Windows is a trademark of Symantec Corporation. All other brand or product names mentioned are trademarks of their respective holders.

CIRCLE 264 ON READER SERVICE CARD

Letters

use *GEM*, and has all but disappeared from the U.S. market.

Steve Jess
Tucson, Arizona

Now, I know that Amiga and Atari both have five letters and that they both begin with the letter "A." However, the Amiga runs AmigaDOS. The Atari runs *GEM*.

Christopher E. Darsch
Richmond, Virginia

Dvorak is flat-out wrong! *GEM* was never used in the Amiga. Dvorak's statement is an insult to the Amiga community.

Lee Rogers
Easton, Pennsylvania

PC John C. Dvorak says he meant to write *GEM*-like, not *GEM*. In fact, Dvorak says he uses and enjoys the Amiga and is familiar with AmigaDOS. He hates to associate with its users, though, since "most of them are pretty rude."—Ed.

LETTERS ON LETTERS

Arthur St. Hilaire (Letters, September 10, 1991) attributes partial credit to the development of chaos theory to Lorentz. He should have been a bit more specific to avoid confusion. H.A. Lorentz is a Nobel Prize-winning physicist from Holland, most prominently associated with the space-time relationships for objects traveling near the speed of light (relativity theory). E.N. Lorenz, who contributed to chaos theory, is a research meteorologist from the United States.

Henry W. Woolard
Fresno, California

The letter from John W. Lucini of Smurfit Recycling Company in Oregon City, Oregon (Letters, September 10, 1991) was an eye-opener and a delight to read. We were so relieved to know that magazines could be recycled that we called Mr. Lucini—who informed us he was amazed at what a response his letter had elicited!

Now, how about a letter from someone who knows where and how disposable printer ribbon cartridges can be recycled—not just into chopped up plastic, but cleaned and reused.

Gwyn Magaditsch
Norco, California

After reading the letter "DOS 5.0 Debate Begins" in your October 15, 1991, issue, I felt better knowing others cannot run *DESQview* with DOS 5.0. There is a solution, though, and it involves using one of *PC Magazine*'s fine utilities, MBOOT.COM (Utilities, February 26, 1991). I have installed MBOOT.COM with DOS 5.0 and DOS 4.1 and now I can run *DESQview*. My thanks to Douglas Boling!

Thomas E. Gough
Peoria, Illinois



MBOOT.COM and all the *PC Magazine* utilities are available from the Software Library found within PC MagNet, our on-line service. For more information on PC MagNet, see the PC MagNet News page, found immediately after the Utilities column.

CORRECTIONS & AMPLIFICATIONS

The Accounting Library ("Two Shortcuts to the Right Accounting Software," October 15, 1991) has always been able to find acceptable accounting programs based on a user's list of desired features. The program can distinguish between high-end and low-end packages, though only by price.

In the May 16, 1990, issue, a utility called PAN was published. PAN is a registered trademark for electronic services for the entertainment industry owned by the Pan Network. For this reason, our utility has been renamed PANDORA. Further information regarding PAN can be obtained from the Pan Network at P.O. Box 162, Skippack, PA 19474, 215-584-0300.

The line of code in the October 15, 1991, Utilities column sidebar "FFF Under Windows: Creating a Dual-Mode Program" should have read

```
STUB 'dosfff.exe'
```

HOW TO WRITE TO PC MAGAZINE

We welcome your comments, complaints, insights, and suggestions. Please send them to Letters, *PC Magazine*, One Park Avenue, New York, NY 10016, or upload them to PC MagNet (see page 10 for access information).

A lot has changed in Accounting Software in 5 years.



Fortunately, a few things haven't.

Like our commitment to research.
Innovation. And leadership.

And here's the proof. Only Macola
has won *PC Magazine*'s Editor's
Choice award three times in a row.

What does this mean to you?
Software that's fast and easy-to-use.
The most customization options.
Local support. More integrated add-on products. LAN performance with no limitations. Powerful software that exceeds your current financial and information management requirements.

In short, accounting software
you'll never outgrow.

Call today, 1-800-468-0834.

MACOLA
SOFTWARE
333 E. Center St. Marion, OH 43302-4148

PC Magazine is a publication of Ziff Communications. Macola is a registered trademark of Macola, Inc. Copyright 1991



ZEOS® 386SX-20!

Only \$1195.

INCREDIBLE 20MHZ ZERO-WAIT PERFORMANCE \$1195!

That's right! Now you can own the incredible new ZEOS 386SX 20MHz system, complete for only \$1195! Using *ultra high speed* 53 nanosecond DRAM, your new ZEOS 386SX-20 delivers *blazing* zero-wait state performance without the need for a cache. And that's just for starters.

Your new ZEOS 386SX-20 also includes the most advanced SX motherboard available anywhere. Because we've not only added incredibly fast 53ns DRAM, we've also integrated the hard and floppy drive controllers *plus* the serial, parallel and game ports *right on the motherboard!* This results in even greater reliability *and* expandability.

ZEOS SX SYSTEMS RATED #1!

After all, the ZEOS 386SX-20 comes from a family of *Editor's Choice* '386 systems. And most recently, in PC Magazine's Service and Reliability issue, ZEOS systems received the #1 SX rating overall. When you receive your new ZEOS 386SX you'll see why ZEOS is #1. Take our case and power supply for instance.

Your new system will include our custom 200 Watt power supply and seven bay SpaceSaver desktop case.

You save space and still have room for lots of future expandability! And the components in your system will last longer too because ZEOS gives you not just one, but *two cooling fans*. After all, the cooler your system runs, the longer it will last. Now that's uncompromising value. That's ZEOS value.

24 HOUR A DAY TOLL FREE SALES AND TECHNICAL SUPPORT!

Too, you will receive our legendary *ZEOS 24 Hour a Day Toll Free Technical Support*. Plus our full 30 Day Absolute Satisfaction Money Back Guarantee, One Full Year Limited Warranty and Express Parts Replacement Policy.

Performance. Quality. Price. Support. These are the hallmarks that have made ZEOS America's favorite choice. These are the values that make ZEOS your best choice as well. You're going to be *very* satisfied. We don't just say it. *We Guarantee it.*

ORDER NOW TOLL FREE 800-423-5891!

Order your new ZEOS 386SX now with confidence. Your choice of ZEOS quality and performance is Guaranteed. Order now toll free by calling 800-423-5891.

INCREDIBLE 20 MHz ZERO-WAIT PERFORMANCE ONLY \$1195

- '386SX-20 CPU, 8/20MHz.
- Ultra Fast 53ns DRAM providing true Zero-Wait state performance.
- 512K memory expandable to a System Total of 16MB. Right on the motherboard.
- 42MB High Speed IDE hard drive. Teac® 1.2MB floppy.
- ZEOS 14" Hi-Res amber monitor with Tilt/Swivel. Includes Genuine Hercules® brand graphics controller!
- ZEOS/RS 101 key SpaceSaver keyboard.
- Two Serial, one Parallel & one Game Port.
- 6-16, 2-8 bit expansion slots. 80387SX math coprocessor support.
- Rugged ZEOS 7-bay SpaceSaver case with our 200 Watt power supply and two cooling fans for added reliability and product life.
- Includes ZEOS 24 Hour a Day Toll Free Technical Support and Customer Satisfaction package.

Options Galore:
Including 14" 1024 VGA, more memory, an incredible selection of hard drives: SCSI, IDE, ESDI RLL or MFM and virtually any other add-on you could want. Ask about other special money saving packages too.

ORDER NOW TOLL FREE 800-423-5891

FAX Orders: 612-633-1325
In Minnesota: 612-633-4591
Outside US and Canada:
612-633-6131
MasterCard, VISA, Discover,
Am Exp, Z-CARD and COD.
Open 24 Hours a day.
365 Days a year!

All prices and specifications are subject to change without notice. Please call for current pricing and warranty details. ZEOS is a publicly traded company, NASDAQ Symbol: ZEOS. © 1990 ZEOS International, Ltd., 530 5th Avenue, N.W., St. Paul, MN 55112. All product and company names are trademarks or registered trademarks of their respective holders.





In 1985 NEC pioneered multiple frequency technology with our MultiSync monitors. Six years later we're redefining the standard with the new FG series. A line of advanced monitors compatible with MS-DOS[®] systems as well as the Mac II line.



C&C
Computers and Communications

© 1991 NEC Technologies, Inc. MultiSync is a registered trademark and FG, FullScreen, FullScan and Reduced Magnetic Field are trademarks of NEC Technologies, Inc. MS-DOS is a registered trademark of Microsoft Corp.
Call 1-800-NEC-INFO (In Canada: 1-800-343-4418). Or call NEC Fast Fax, 1-800-366-0476. Request #1532.

The revolutionary MultiSync® 3FGx™ monitor. The future has never looked brighter. Or sharper. Or more accurate. Or mo

Introducing the MultiSync 3FGx. A monitor so bright, sharp and clear, it will improve your vision. The 3FGx has advanced technology to meet the demands of today's software. And features that make it the best monitor as you standardize on windowing environments.

The 15" screen with FullScan™ capability provides edge-to-edge images with a 36% greater active display area than most 14" monitors. While the flat square screen's high-contrast surface reduces blurring and distortion and displays colors more vibrantly. Higher refresh rates enable stable, flicker-free images. Plus, the 3FGx is 20% brighter with no loss of focus.

ErgoDesign™ elements enhance comfort and productivity with an antistatic screen coating that prevents dust attraction. And our Reduced Magnetic Field™ technology lowers ELF and VLF emissions to meet even the strict Swedish MPR II guidelines.

The 3FGx supports VGA, SuperVGA, XGA, 1024 x 768 non-interlaced and Mac II standards. Well, we could go on and on. And if history is any indication, we will.

Because  is the way you want to go.

NEC

Our New Color Monitor Will Sharpen Your Vision.



Capture every detail
with our EagleEye™
1024 x 768 resolution



Now you can see the most complex diagrams and color illustrations in incredible detail. Crisp and clear—even through Windows™. Without flicker to spoil the view.

1024 x 768 Resolution Without Electronic Short Cuts.

There are basically two kinds of high-resolution Super VGA color monitors. Those that are interlaced. And those that are not.

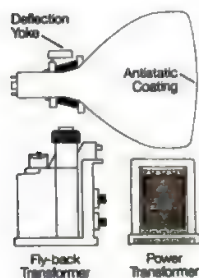
Now, a picture that's interlaced may sound like something you'd want. But interlacing is merely a way to use the same old electronics to produce higher-resolution monitors. With interlacing, the monitor's electron beams can only refresh every other line of pixels (dots) on each pass of the screen.

Understandably, this shortcut causes the screen to flicker, creating eyestrain.

"Flicker Free" monitors, made with longer-life phosphors, are an attempt to solve this problem. They slow the flicker, but produce other visual side-effects, such as "ghosting."

At Samtron, on the other hand, we designed our 14" 1024 x 768 color monitors the right way. With non-interlaced technology. With the power to light up every pixel on every pass. And we gave it a tight, 0.28mm dot pitch.

So, you get a pinpoint-sharp picture that hasn't a hint of flicker.



Samtron's new VLMF monitors use a special shielding on the deflection yoke, an antistatic CRT coating, a special type of fly-back transformer, plus a power transformer specifically designed to reduce magnetic emissions.

Our VLMF Takes The Fear Out Of Being Close.

If you're concerned about electronic emissions, this high-res monitor is the one to cozy up to. Its VLMF (Very Low Magnetic Field) cuts emissions to less than 25 milligauss, measured at 20" from the screen.

That's even lower than Sweden's stringent standards call for.

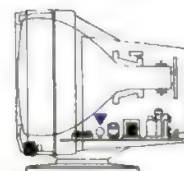
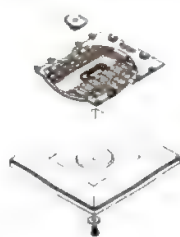
Picture Perfect Technology Is More Than Meets The Eye.

Behind our high-resolution screen is a design so unique it results in a picture perfect display.

It starts with our new compact OneBOARD™ that contains all the electronics, even the power supply. Thus streamlining interior parts. Cutting the heat. Adding reliability. And extending monitor life.

It also plugs into any power supply from 90 to 260 volts. Has an automatic degaussing coil. Up-front controls. Non-glare face. And SuperGLIDE™ our one hand tilt-and-swivel system.

New SuperGLIDE Design.



The automatic degaussing coil, switching-mode power supply, two-stage line filter and power supply on OneBOARD.

Altogether, the SC-428VXL gives you everything you want in a color 1024 x 768 display. Without the things you don't want.

SAMTRON

WE'RE WORTH WATCHING

14251 E. Firestone Blvd., Suite 101, La Mirada, CA 90638.
Phone (213) 802-8425.

by
Gus Venditto

Pipeline

A Look at the Trends Shaping the Personal Computer Market

Intel Readies Key Tools For Integrating DVI with MPC

The IBM Ultimedia PC and the Tandy Multimedia PC reviewed in last issue's First Looks section will end up having more in common than their names, thanks to some recent announcements by Intel.

The heart of the Ultimedia is a DVI (digital video interactive) board from Intel, which provides the compression/decompression needed to manipulate and view video on a PC. Intel is in the process of bringing out a series of products and support tools that will not only make DVI a practical alternative to MPC, it will also make DVI compatible with MPC.

The most important is AVK (audio-video software kernel), a low-level programming interface that will let OS/2 1.3 and Windows 3.0 run DVI boards.

The software, which should be out early next year, is designed to access the Media Control Interface (MCI) that sits underneath Multimedia Windows. (For a summary of MPC and MCI, see Charles Petzold's Environments column in the October 29, 1991, issue.)

Because AVK provides the same functions to each environment, you could control video clips through a DVI board using the same programs you'd use to create an MPC presentation. For example, the image on this page shows a video clip running in Windows. The video was displayed by a DVI board in a 386 PC using Asymetrix's Multimedia Extensions Toolkit. The video clip is treated like any other object on-screen. Moving the application to a system without DVI would require only the replacement of the window that

displays the video with an MPC-compatible image.

Intel will sell its ActionMedia II Delivery Board for \$1,895 (IBM uses its own version of the board in its Ultimedia PC). An add-on board that lets you capture video from a camcorder or VCR will be \$695. Software development kits for OS/2 or Windows will cost \$3,000.

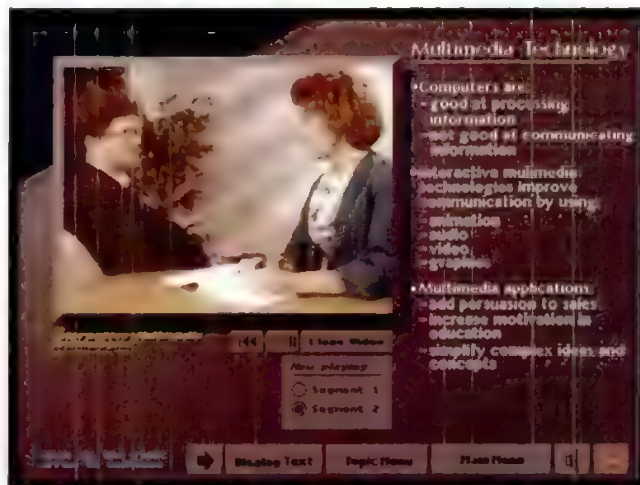
Nolan Bushnell Plans to Make Connectivity Easier

Nolan Bushnell, the creator of Pong and a founder of Atari, has taken the helm at a networking company, Octus. The San Diego-based company will be introducing several products to simplify network printing.

Bushnell says he's been looking for an area where his talent for making computers easier to use will be best applied. And few would argue that he's found the right target.

The company, which was previously known as Office Automation Systems, will first sell PDL-Net, a board that will allow network users to print in their choice of PostScript, HP's PCL 5, HPGL, or TrueImage without any special networking configuration choices. The board can be attached to any PCL 4 printer.

The company's next product, *Print Net*, is software that will manage soft fonts on a print server. And early next year, the company will release a server that can manage faxes, modems, or voice messages. The server will include 386-based boards to manage the in- and outflow of those functions. The server's



The window in this multimedia application displays live-action video captured, compressed, and controlled by Intel's ActionMedia II board, which uses DVI.

hard disk will store fax files and voice messages.

So far, it sounds like a fairly typical slate of products from a new company.

What is unique about Bushnell's new ideas is the way voice messages will be managed on the server. It will be compatible with several common PBX systems, giving you the ability to record voice messages on your desk phone. Once stored on the server, you'll be able to treat them like data files that can be attached to messages. You'll also be able to control voice-mail messages that you've received on your local phone, raising the possibility of attaching incoming phone messages to LAN mail.

Next year, you're likely to see a number of companies, including Lotus, provide voice-attachment capabilities in standard applications.

Bushnell's voice server is one of the first practical ideas for providing voice capability to an entire office without adding a voice card to every system. There will probably be many more.

IBM Changes Its Software Lineup

Two years ago, IBM created the Desktop Software group, a small division that set out to create a PC software operation for IBM.

It acquired several promising applications: *Hollywood*, an innovative presentation graphics program, and *Current*, an ambitious personal information manager. It also made some significant improvements to software that IBM had acquired earlier, *Platinum* and *Storyboard*, and it was in the process of developing a successor to DisplayWrite.

Now, in a reorganization, IBM is giving up on the idea of a software publishing house within the company and has reassigned programs to other divisions to keep them in line with other strategic directions.

Claris, the software division of Apple, has acquired marketing rights to *Hollywood*; Claris says it will develop Mac and OS/2 versions. *Platinum* will be marketed by its original

CONTINUES ON PAGE 30

Pipeline

CONTINUED FROM PAGE 29

publisher. *Storyboard* will be marketed by IBM's multimedia division. *Current* will be developed by the Office Systems group as part of an effort to link it to e-mail systems, such as PROFS, and provide network file-sharing.

The only significant project that IBM has yet to reassign is the word processing development work. As of this writing, IBM was unable to say if it would proceed with its plan to develop *Signature* as an upgrade path for *DisplayWrite*.

There'll Be a Pen System to Suit Any Fancy

Recent announcements from GO Corp. and Microsoft have already made it clear that there will be a choice in pen-based systems. Now, another approach is about to be unveiled from PI Systems of Portland, Oregon.

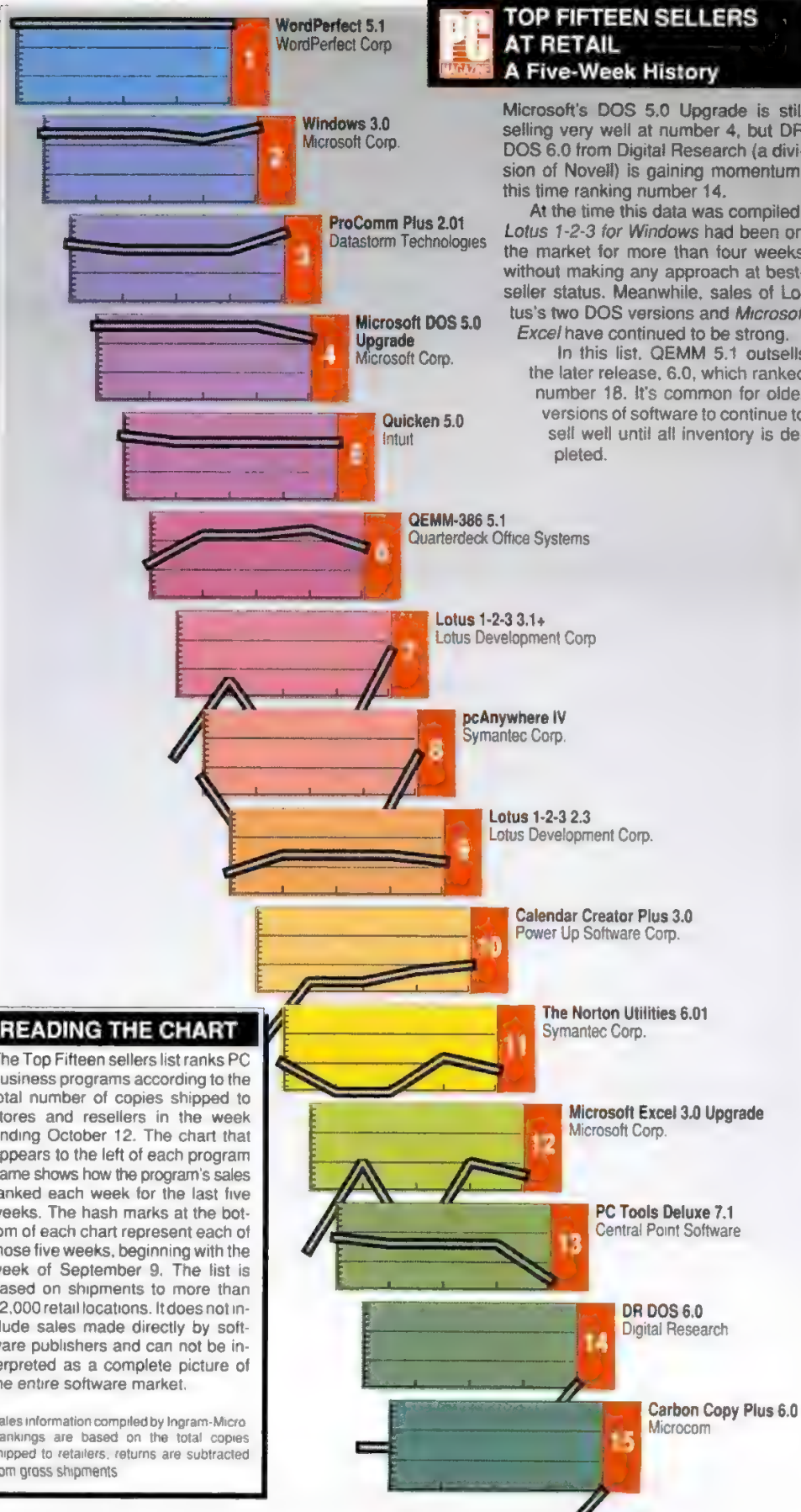
PI will soon ship a three-pound notebook that is designed for single-task data collection. It will retail for about \$2,000 and will come with PC-based tools for building database applications.

Its character recognition tools will be weaker than those supplied by GO Corp.'s *PenPoint* and Microsoft's *Pen* extensions to *Windows*. But, like the *GridSlate*, the notebook will be designed for collection of data in the field and will have options for transmitting data via either spread-spectrum radio or cellular modems.

Lotus Makes 1-2-3/W Upgrade Official

This column recently reported (November 26, 1991) that Lotus had fixed some bugs in *1-2-3 for Windows* in a "slipstream" release, which means that the product was changed without a version number revision.

Now, Lotus has made the corrected version an official release: Version 1.0a. Anyone who bought *1-2-3 for Windows* 1.0 can receive a free upgrade to 1.0a.



Microsoft's DOS 5.0 Upgrade is still selling very well at number 4, but DR DOS 6.0 from Digital Research (a division of Novell) is gaining momentum, this time ranking number 14.

At the time this data was compiled, *Lotus 1-2-3 for Windows* had been on the market for more than four weeks without making any approach at best-seller status. Meanwhile, sales of Lotus's two DOS versions and *Microsoft Excel* have continued to be strong.

In this list, QEMM 5.1 outsells the later release, 6.0, which ranked number 18. It's common for older versions of software to continue to sell well until all inventory is depleted.

Quality Since 1983



Here's Dataworld's new **486/33 Mini-Laptop...**

Finally, there's a battery-operated mini-laptop with the power you need for Windows 3.0, CAD/CAM and other advanced applications!

True Windows' Power

The LP433's 1000x brighter contrast and 350% wider viewing angle will enable you to see the fine graphic detail required to maximize your Windows 3.0 computing working efficiency! You'll find using Windows easier and faster than ever!

The rapid refresh-rate of the LP433's gas-plasma display lets you move the Windows' pointer as fast as you want



without it disappearing as you move it.

**CAD/CAM Users,
Lotus 1-2-3 Users,
Data Base Users
& UNIX Users**

The combination of the LP433's 33Mhz CPU and its built-in math coprocessor yield the dynamic number-crunching power you need—there is nothing

else to buy! From

recalculating on-screen graphics, to refiguring complex spreadsheets, indexing super-large data bases or living in the multitasking world of UNIX—the LP433 is

your solution!

For simultaneous presentations—the LP433 is ready for your large SVGA color monitor and 101 keyboard.

Dataworld's efficient, new-design gas-plasma video uses **72% less power!** Your battery will last up to **2 hours!**

**Data LP433
486DX-33 Mini-Laptop
\$3495.**

Gas Plasma VGA • 2 MB RAM, Exp. to 6 or 10MB
Ext. 1024x768 Video Adapter with 512K
80MB HD—160MB Cap. w/Stacker™ Compr.
1.44MB 3.5" FDD • MS-DOS 5.0
Built-in half-length card slot • \$738 Software Bundle
— FCC B Approved —

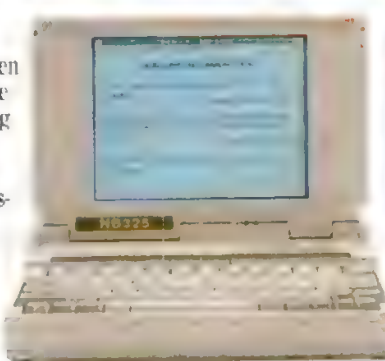
And, Dataworld's new **25Mhz 386SXL—with 2MB RAM & an 80MB hard disk!**

Now the highly-rated Dataworld NB320 is even better! We've added the latest 25Mhz SXL CPU—boosting the total performance speed by 25%! And, we've *quadrupled* the size of the hard disk to an impressive **80MB!**

Dataworld's NB325 measures *down* to the right 8.5"x11" size (and a *light* 6.9lbs)—just right for your briefcase! It also boasts an extra **2nd serial port**.

It's Expandable, Too!

Upgrade to 8MB of high-speed RAM, a 387SX math coprocessor, a full-speed 9600/2400B internal fax modem, and install up to (3) 16-bit expansion cards with the optional external Expansion Box. Charge a



"A solid, complete machine that sets the standard for the rest of the industry."
— Computer Shopper Magazine

2nd battery while you're away with an extra battery charger. Compute on the road with a automobile power adapter.

Free \$738 Software to double your HD & More!

We include FastLynx™ for easy file transfers, Stacker™ 2.0 to double the size of your HD to an amazing 160MB, MS-DOS 5.0 and more—worth \$100's of dollars!

The NB325 is packed with more than we have room to write about—call or fax us for a complete list of options! We'll ship yours ASAP!

Data NB325 \$2150.

☐ 2MB RAM ☐ 25Mhz 386SXL CPU
☐ 80MB HD—160MB w/Stacker™ comp.
☐ 2 Serial & Ext. 101 or PS/2 Kbd. Ports
☐ 80 Key Keyboard ☐ 3.5" 1.44MB FDD
☐ Backlit VGA w/32 shades ☐ Padded Case
☐ FastLynx™, Stacker™ 2.0 & MS-DOS 5.0
— FCC B Approved —

Call 800/736-3282

**Quality Since 1983
30-Day Money Back Guarantee**



ZEOS[®] '486

Now, You can unleash ZEOS '486 EISA

THE ZEOS '486 EISA

"ZEOS...performed best on our tests, and they offer the best overall packages."

**—PC Magazine,
Editor's Choice**

"ZEOS speeds to the head of this pack of EISA systems."

—PC Week

"The ZEOS '486 offers the best choice of all!"

—Computer Shopper

"Outstanding!"

—PC Magazine

LOTUS/WINDOWS BUNDLE!

Be Sure to ask about our Lotus 1-2-3 for Windows and Ami Pro 2.0 special Windows Bundle! Included with every ZEOS Windows package!



EISA!

Power. Editor's Choice!

"A MUST FOR THE CORPORATE USER" — PC MAGAZINE



Unleash the power! Unleash your own ZEOS '486 EISA. *PC Magazine* calls it "outstanding." If it's your first '486, you will quite likely call it unbelievable. Believe it.

In awarding your new ZEOS '486 the coveted *Editor's Choice Award*, *PC Magazine* said the ZEOS '486 EISA was "best on our tests." They went on to note the ZEOS '486 is "both surprisingly useable and affordable." But that really shouldn't come as a surprise. After all, this ZEOS '486 powerhouse comes from a family of *Eight* ZEOS Editor's Choice machines. Now let's talk real '486 power:

THE POWER OF EISA

It begins with the EISA bus. *PC Magazine* found that the 32-bit EISA bus when combined with our EISA disk caching controller will provide performance "easily twice as fast (and occasionally ten times as fast) as an AT-bus computer with the same microprocessor and megahertz rating." Now that's *fast*!

But what about compatibility? While the '486 processor offers full software compatibility, the EISA bus will accept your present eight and sixteen bit expansion cards and run them without a hitch. That's the advantage of the EISA bus. Incredible performance with complete compatibility. That's your new ZEOS '486 EISA.

"TWEAKING AND REFINING" A ZEOS HALLMARK.

And, speaking of performance. In their *Editor's Choice* review, *PC Magazine* noted "ZEOS has a reputation for tweaking and refining that shows." That's the ZEOS way.

Attention to detail really makes the difference. We're talking about important details, items you may not even notice at first. Like two cooling fans in EVERY ZEOS '486. And cabinets *Loaded* with drive bays. Loaded too with 300 Watts of power and a motherboard that will take up to 32MB *right on board*. And more.

"SUPERLATIVE SERVICE AND SUPPORT"

"*Superlative Service and Support.*" That's what *PC Magazine* calls ZEOS' 24 Hour a Day Toll Free Sales and Technical Support program. We're here any time you need us—day or night.

And that's only the start of your ZEOS Customer Satisfaction package. Add to it our 30 Day Absolute Satisfaction Money Back Guarantee, One Full Year Limited Warranty and our Express Parts Replace-

ment Policy. You're going to be very satisfied. We don't just say it. *We Guarantee It!*

ORDER YOUR ZEOS '486 EISA TODAY!

PC Magazine says the ZEOS '486 is "a must for the corporate user." Corporate or otherwise, the ZEOS *Editor's Choice* '486 EISA is the one for you. So why not pick up the phone and give us a call right now? Your own expert Systems Consultant is waiting here to help you tailor your new ZEOS '486 EISA just as you want it. Your absolute satisfaction is *Guaranteed!*

CALL NOW TOLL FREE

800-423-5891

DON'T FORGET THE OPTIONS!

ZEOS has them all. Starting with blazing 32-bit EISA cards and every other high performance option you could possibly want. On-site service is available too. Call 800-423-5891 for details.

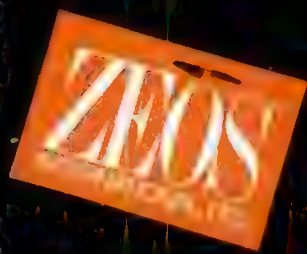


**THE COMPLETE
ZEOS '486-33MHz
EISA DESKTOP!
128K CACHE, 85MB
DRIVE & MORE.
ONLY \$2795**

- '486-33MHz CPU with built-in Cache and Math Coprocessor.
- High Speed 128K SRAM Secondary Cache.
- 8-32 EISA expansion slots. Also accepts 8-bit and 16-bit cards.
- 1MB of High Speed DRAM, expandable to a Total of 32MB.
- Ultra Fast 85MB IDE Hard Drive, Teac® 1.2MB Floppy Drive.
- Genuine Hercules® brand graphics controller. 14" High-Res Amber Display with Tilt/Swivel base.
- ZEOS/RS 101 key Space Saver Keyboard.
- ZEOS I/O Card with Two High Speed Serial plus Parallel & Game port.
- Full Weitek® math coprocessor support.
- Rugged ZEOS 7-bay desktop case with 300 Watt Power Supply and two cooling fans for increased component life and system expandability.
- Wrap it all up with 24 Hour a Day, 365 Day per year Toll Free Technical and Sales Support on your ZEOS Hotline. You've got a winner!

**ORDER NOW TOLL FREE
800-423-5891**

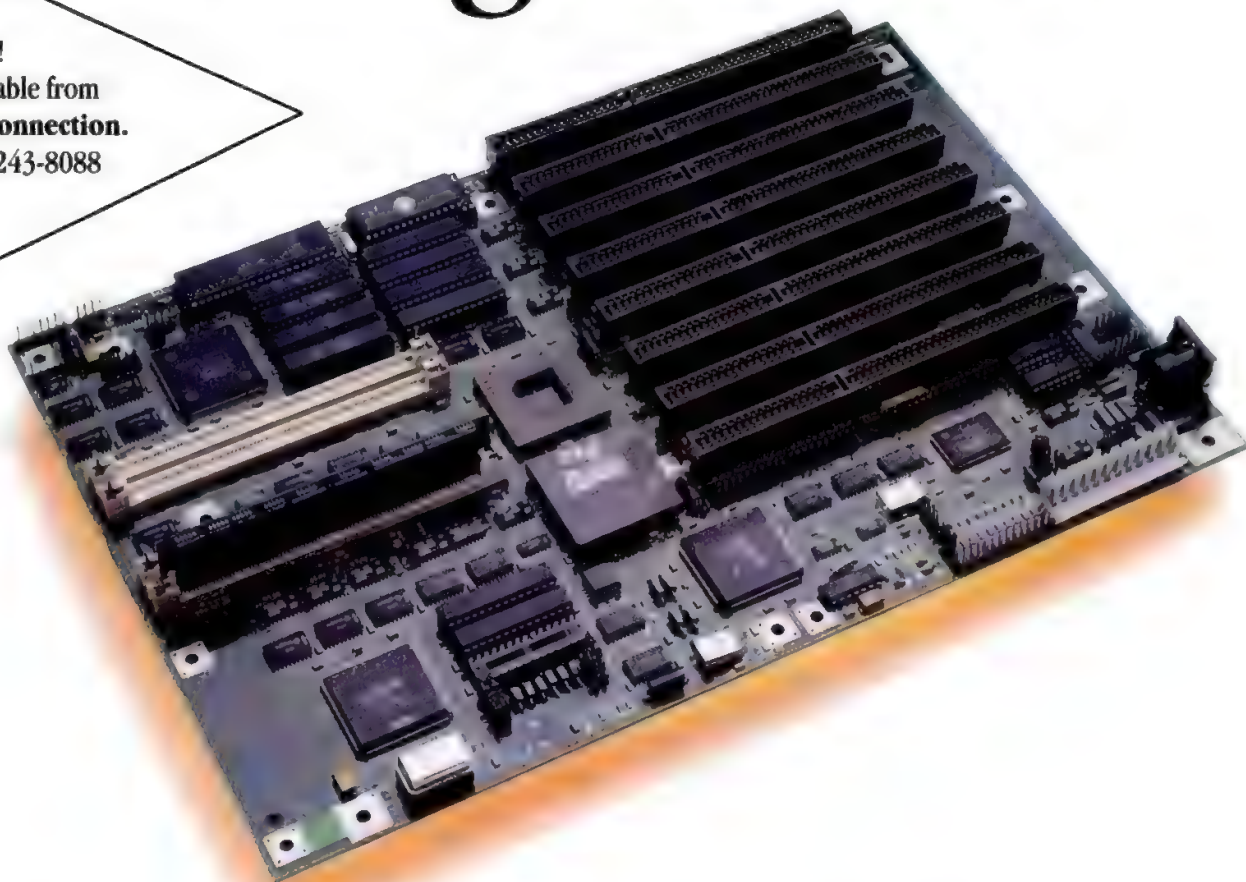
FAX Orders Dial: 612-633-1321
Minnesota Call: 612-633-4591
TDD (Hearing Impaired) Order Call: 800-228-5389
Outside US and Canada Call: 612-633-6131
MasterCard, VISA, Discover, Am Exp, Z-CARD and COD.
Open 24 Hours a Day, 365 Days a year!



Purchase orders from Fortune 1000 companies, governments and institutions subject to approval. Leasing programs available. All prices and specifications subject to change without notice. Please call to confirm pricing, specification and warranty details. The following are trademarks of their respective corporations: ZEOS and Z-Card of ZEOS International Ltd. © ZEOS International Ltd., 530 5th Avenue, N.W., St. Paul, MN 55112 USA. ZEOS is a publicly traded company, NASDAQ symbol ZEOS.

SmörgåsBoard!

Now!!
Available from
PC Connection.
800-243-8088



INTRODUCING THE 386N SERIES—

STARTS FROM \$895: Feast your eyes on the new 386N MotherBoard from Hauppauge. Our 32-bit 25 and 33MHz 386DX boards boast the latest in VLSI technology. You'll find everything you need on board, including SIMM memory expandable from 1MByte to 32MBytes; static RAM cache up to 256K; serial and parallel I/O ports; floppy and IDE disk controllers and much more. Choose your own VGA to complete "the Mother of all MotherBoards!"



FLEXIBILITY: The "N" in 386N stands for *New* and *Next* generation. Developed with the new super I/O chipset, our boards are designed to exploit the next generation of SIMM modules to bring on-board memory expansion to **128MBytes!** The N series also features Intelligent BIOS™ making it easy for you to install a variety of new I/O cards. What's more, Intelligent BIOS supports future generation IDE disk drives. Simply add components as you see fit!

PERFORMANCE: Thanks to high-speed static RAM cache—from 0 to 256K—you can automatically make CAD, database and networking programs really *cook*. The more cache, the faster your programs go. (Regarding compatibility, if you assume it's excellent, you're right.)

RELIABILITY: Built to Hauppauge's exacting quality standards, the 386N boards are available in AT and XT sizes to work with your Tower, Minitor, Desktop or Workstation chassis. All boards are made in the USA and backed by a 1-year warranty.

If you're power hungry, we've got dinner. Our new 386N series combines performance, flexibility and low cost to help you configure the most successful systems on the market. For more on our boards, file servers and workstations, call: **1-800-443-6284.**

Hauppauge Computer Works, Inc.
91 Cabot Court
Hauppauge, New York 11788
In New York: **516-434-1600** In Europe: **(49) 2161-17063**

Hauppauge!

First Looks

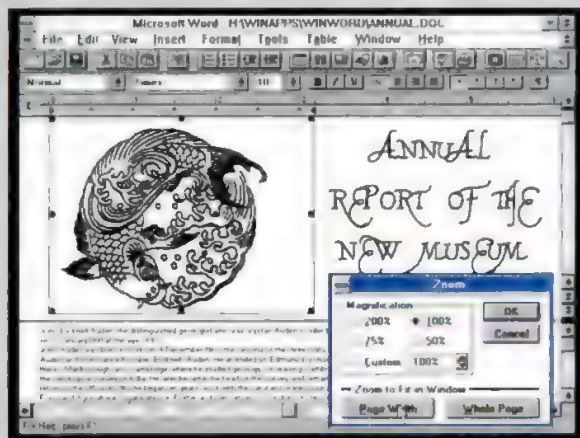
Hands-on Reviews of the Latest Products

Word for Windows 2.0: Powerful Editing, Dozens of Convenience Features

HANDS ON
by Edward Mendelson

Until Version 2.0 of Microsoft's \$495 *Word for Windows* appeared a few weeks ago, anyone in the market for a full-featured *Windows* word processor had to choose between the graphic panache of *Ami Pro*'s intuitive interface and the raw-edged industrial-strength text-processing of *Word for Windows* 1.1. Now a new *WinWord* adds spectacular refinements to its original strength, and the choice among *Windows* word processors is suddenly more complex than ever.

WinWord 2.0 brings new flexibility to text entry and formatting and adds powerful charting, graphics, and equations functions. Small but significant details—such as an insertion bar that slants in italic text so that you know exactly where you are—remove most of



Word for Windows, which now supports movable graphics frames, lets you divide a window into panes and view your files at different scales in each view.

the inconveniences that *Windows* users accept as the price to pay for a GUI environment.

Although the new version is far richer than the old, it's much

easier to use, thanks to a customizable icon bar, well-organized menus, and informative dialog boxes, plus quick access to help from most menus. If

DECEMBER 31
REVIEW INDEX

Windows Draw:

A winning combo of price and features 38

LapLink Pro:

Adds remote transfer to the traveling show 44

QBlazer:

9,600-bps modem in the palm of your hand..... 50

you've ever struggled to print envelopes from a *Windows* word processor, now you need only click on the envelope icon and sit back while *Word* finds the address and prints the envelope for you. The whole program seems transformed from an uncomfortable, laconic environment into a luxurious and friendly one.

Microsoft's goals for the new version were increased speed and ease of use for everyday tasks. To that end, *Word* now prints and downloads fonts

CONTINUES ON PAGE 36

MacroMind's Action!: Wet Your Multimedia Feet Without Drowning

HANDS ON
by Steve Rose

MacroMind was in the multimedia business long before the PC showed any signs of a multimedia life. Its popular *Director* software appeared on the Macintosh in 1987, offering multimedia presentation tools geared toward professional creators.

Action!, MacroMind's first PC presentation product, is a

much less demanding package. It seems to have been designed for presentation graphics users who are ready to take the next step beyond traditional linear slide shows. *Action!*'s slidelike screens can contain moving elements (text and graphics), sound, on-screen hot buttons, and backgrounds. You can import entire animation sequences from *Director* files.

While this \$495 *Windows*

package (you'll need *Windows* Multimedia Extensions to use its sound capabilities) pushes beyond the limits of high-end presentation packages like *Microsoft PowerPoint* and *Aldus Persuasion*, it lacks the basic data-handling and charting functions that we've come to expect in our presentation packages. And it shouldn't be confused with packages like MacroMind's *Director*, which features true high-end path animation, or Autodesk's *Animator*, which offers full-screen 2-D cel animation. *Action!*'s motion is more simplistic; hence, more manageable.

The program comes with 120 templates that include text, graphics, motion, and sound. Just replace the text and graphics with your own and you've got a slide—a "scene" in *Action!* terms. (You can also define your own templates.)

Scenes contain five different kinds of data: text, graphics, sound, button, and movie. Backgrounds can be solid, gradient, pattern, or imported bitmaps. The program comes with two 10-second sound-effect clips and four pieces of 30-second music clips, all stored as .WAV files. There's a clip-art

CONTINUES ON PAGE 37

First Looks

Word for Windows

CONTINUED FROM PAGE 35

at high speed (although not as fast as *Ami Pro*'s optional background printing), and it uses fewer system resources than any rival package. Ease-of-use improvements include drop-and-drag movement with the mouse of text, graphics, and rows and columns in tables.

You also get a brilliantly designed sequence of mail-merge menus that hand-hold beginners through every step, from creating a data file (or importing from *dBASE*, *1-2-3*, *Excel*, or *WordPerfect*) to an automatic check of data integrity, as well as programmed merges and printing of the merged documents.

Word's new graphics features include an equation editor based on Design Sciences' *MathType* (more intuitive than the equation editor in *Ami Pro*), a charting module taken from *Excel*, a drawing program with a freehand tool (but weak text manipulation) taken from *PowerPoint*, and a slightly silly *WordArt* module that lets you slant or curve text using the module's built-in fonts.

All these modules are Object Linking and Embedding servers, so when you click on a graphic to edit it you automatically open the module as a separate application, with its own window and menus. *Ami Pro*'s graphics, in contrast, are built-in, so you edit the graphic on the same screen with the rest of the document. But *Word*'s modules have the advantage of being available to any application (including *Ami Pro*) that supports OLE. These features make *Word* fill 15MB of disk space in a full installation, but you can whittle it down to 1.5MB by giving up graphics and file conversions.

Word still betters rival GUI programs in text-editing, and unlike all other *Windows* word processors (except the forthcoming *WordPerfect for Windows*), gives you all the text-oriented features you get with a

character-based program. *Word* lets you press a function key and extend the selection with Find, GoTo, or any other command. *Ami Pro* and other programs let you select text only by dragging the mouse or holding down a Shift key while using cursor keys, and won't let you use menus while you do. *Word*'s extend-selection key also lets you extend the selection by pressing an alpha key; so each time you press the period, you define one more sentence.

A go-back key lets you return to the last three points where you typed or entered text, and, when you reopen a file, remembers where you were when you closed it. In addition to *Windows*' standard shortcut keys for cut, copy, and paste, *Word* adds Ctrl-key equivalents used in the Macintosh and expected in *Windows 3.1*.

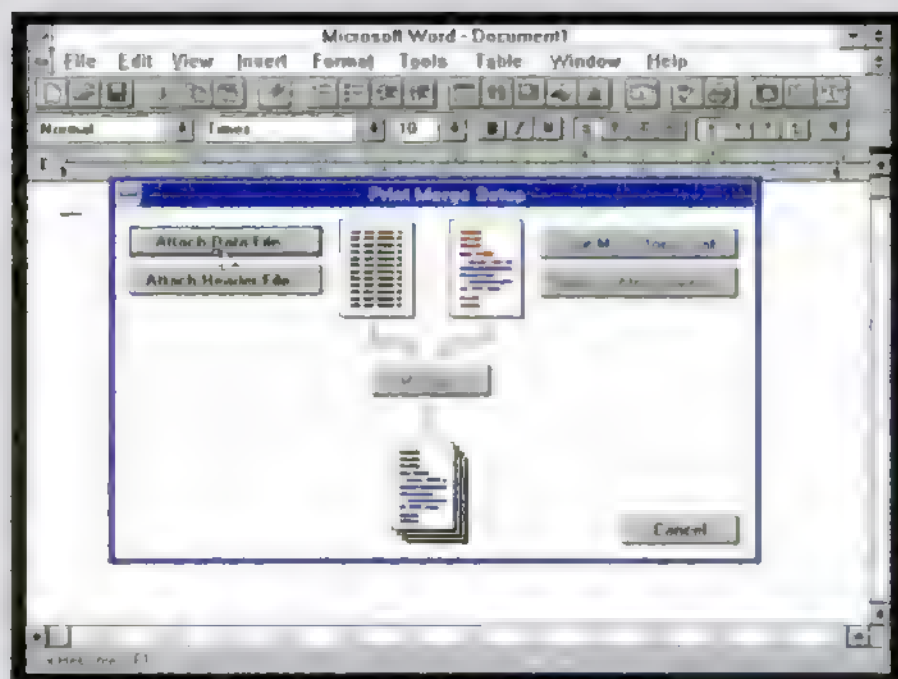
An Insert Symbol menu displays special characters and lets you insert by moving the cursor to the one you want, but *Word* lacks *WordPerfect*'s Compose feature for quick insertion of foreign and technical characters. An icon-click gives you easily customizable bullets and numbering, and a supplied macro creates drop caps.

Word's elaborate file finder has an optional preview screen that displays a miniature image of your files, complete with fonts and graphics. You can set the same screen to display long filenames or summary informa-

tion, and you can copy, print, or delete listed files.

Microsoft brazenly targets *WordPerfect* users by including an optional keyboard mapping that, when you press a *WordPerfect* key, guides you through the equivalent *Word* function. *Word* transparently imports *WordPerfect* files, but without all of the features in place. *WordPerfect*'s parallel columns, for example, turn into snaking columns in *Word*. Any *WordPerfect* user who makes the switch gives up *WordPerfect*'s advanced printer support and control over formatting, but gains *Word*'s collapsible outlining and powerful styles. *Word* now has *WordPerfect*'s ability to mix portrait and landscape pages in a single document, as well as its option to mark text by language for seamless English and foreign spell-checking. Other improvements include line spacing that no longer changes when you add superscripts and a well-integrated grammar-checker.

Other aspects of *Word* haven't improved. The macro language is virtually unchanged, and trails behind *Ami Pro*'s macro language, which has global variables, dynamic dialog boxes, and other crucial features. Styles and templates are still harder to manage than they should be, and you still need to burrow through the menus to get a word count. Parts of the menu structure are still



Word's Print Merge help screen guides the user through each stage of an often difficult process. Each item on this menu leads to detailed submenus and instructions.

obscure; for example, you insert a header from the View menu, not the Insert menu. *Word* still hyphenates only on command, not on the fly.

Some features don't work as advertised, with potentially disastrous results. If you open a disk file, change a few words in a few paragraphs, and then use the Compare Versions menu to mark differences between the screen and disk files, *Word* redlines the full text of each paragraph that contains even one altered character. This is unhelpful, not dangerous—but if you then select Undo Revisions from the Revision Marks menu, *Word* deletes the full text of every redlined paragraph from your file.

The Edit Undo menu can sometimes, but not always, restore the text if you use it immediately, but if the removed paragraphs weren't on the editing screen, you have no way of noticing their loss until it's too late. Corporate managers who value their data should probably remove Compare Versions from *Word*'s menu.

The majority of *Word*'s features, however, let you enter, format, retrieve, and print data with intuitive ease. Microsoft's new version is a triumph of flexibility and convenience and combines strong graphics features with unparalleled ease in creating and editing text. ■



FACT FILE

Word for Windows, Version 2.0

Microsoft Corp., One Microsoft Way, Redmond, WA 98052; 800-426-9200, 206-882-8080. List Price: \$495.

Requires: 80286 processor or better; 2MB RAM (3MB recommended for networks or for use with other applications); *Windows 3.0*.

In Short: *Word for Windows*, always powerful for text processing, now includes luxuries like automatic envelope printing and effortless mail-merge. Improvements in speed and clear and informative menus make it a pleasure to use, and OLE-integrated modules add strong graphics support.

CIRCLE 704 ON READER SERVICE CARD

First Looks

Action!

CONTINUED FROM PAGE 35

collection of 8 bitmap images and 13 animated graphics. (MacroMind is currently working on a collection of CD-ROM-based clips.)

In *Action!*, you build your project by defining a set of scenes and then arranging them using a slide-sorter window. You can also look at your project in an outline view that shows each scene and its component objects in list form. Unlike more traditional packages, a VCR-like control panel lets you start, stop, fast forward, and rewind each presentation.

Action! specializes in transitional effects between scenes; for example, choosing standard off-screen entrances, such as "enter from the left." You can also animate text and graphic objects within scenes by specifying a path across the screen, segment by segment. This more traditional animation can cover a range of techniques: changes in object position, size, and color. Unlike cel-based animation, you can't change an object's shape. By layering objects, you can build complex scenes.

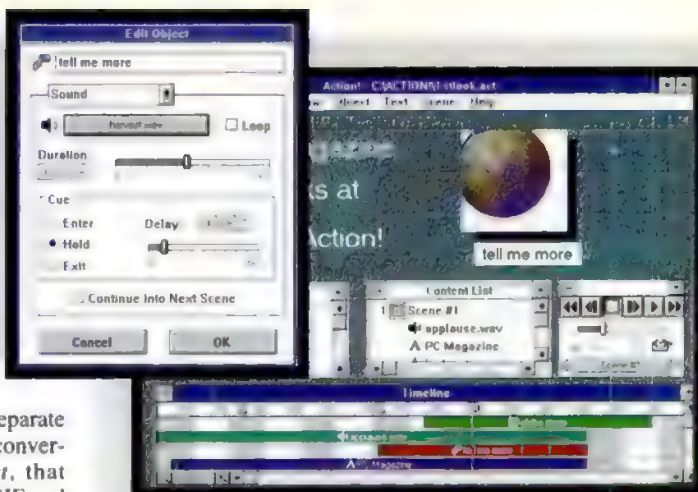
Presentations can advance automatically, wait for a mouse-click or keystroke from the user, or wait for the user to select an object on-screen that's linked to a certain action.

To track objects across time, you can view a corresponding timeline at the bottom of the screen that indicates the duration of on-screen elements.

In addition to .WAV (the standard digital waveform sound-file format for Multimedia Windows), *Action!* can also play clips from a CD based on position and length—a feature that saves on-disk storage space. The program has no MIDI capabilities, and the only way to incorporate voice is to import it as a .WAV file.

Action! reads only three graphics file formats directly: Windows .BMP, .DIB (device-independent bitmap), and .WMF, and the .WAV file format for music and sound. But

Dialog boxes let you set the characteristics of each object so there's no need for a scripting language.



MacroMind tosses in a separate Windows-based image-conversion program, *Convert*, that translates TIFF, EPS, .GIF and .PCX files to either supported graphic format.

Action! has no runtime player. Anyone who wants to view a presentation on a PC must have a copy of the full program—a serious drawback that is common to Windows animation packages. Nor is there support for slide service bureaus.

While it's possible to create slides and overheads using standard Windows-supported devices, *Action!* presentations are intended to be played back directly on the screen, projected through a video projector, or recorded to videotape.

Simple scenes are simple to produce using *Action!*, but the difficulty level jumps exponentially. For example, you can

Action!'s screens can be viewed as frames, in a slide-sorter view, a time-line, or by using VCR-like controls.

easily build a bullet chart with just a few techniques, either by "flying in" each line of text, one by one, or by setting up a "reveal" for a text block. Once you start dealing with multiple objects in a scene and with on-screen buttons, you'll have to do more up-front planning. You'll also have to get accustomed to a few idiosyncrasies, such as the way some menu items are on/off choices while others, which look similar, ask you to choose from a set.

Users with any computer graphics or presentation experi-

ence should master the presentation metaphors with minimal effort. An included videotape tutorial helps. But it naturally takes a while to develop a knack for picking objects and integrating elements.

Despite its attempt at taking presentations to a new level, *Action!* has deficiencies. The lack of a run-time player and charting component is a liability for most presenters; there's no DDE (Dynamic Data Exchange) or OLE (Object Linking and Embedding) support.

Action! is an evolutionary product that helps us make the transition from the static world of presentation graphics to a richer multimedia environment, but it's quite complex while delivering limited capabilities. ■

ACTION! IN PERSPECTIVE

Action!'s not the only choice for more dynamic presentation. For Windows users, *Action!* competes with highly regarded presentation programs such as *Hollywood* (recently sold by IBM to Apple's Claris subsidiary), *Aldus Persuasion*, and *Micrografx's Charisma*. All of these offer superior charting capability; *Hollywood* also offers a distributable runtime player even though it doesn't offer the buttons and on-screen navigation features in *Action!*

Script-based programs such as Spinnaker's *Plus* and Asymetrix *Toolbook* can duplicate many of *Action!'s*

presentation tools and offer more precise control of user interactions. The trade-off here is that project authors have to learn a scripting language. And the scripting programs lack overview tools such as the slide sorter and outliner.

Several Windows animation programs now in development may also surpass *Action!*. Due to market at any moment, Gold Disk's *Animation Works Interactive* will offer more complex types of animation and more data types. But in its favor, *Action!* offers the comfort of the familiar slide-based presentation metaphor.—SR



FACT FILE

Action!

MacroMind, 600 Townsend St., San Francisco, CA 94103; 415-442-0200

List Price: \$495.

Requires: 286 PC or better, 2MB RAM, hard disk, 3.5- or 5.25-inch high-density floppy disk drive, VGA monitor, DOS 3.1 or later, Windows 3.0.

In Short: *Action!* adds motion, sound, and limited interactivity to presentations. The program is easy to learn and use, but lacks some basic features such as charting, DDE links, and a runtime player.

CIRCLE 706 ON READER SERVICE CARD

Windows Draw Gives Business Users the Best Set of Drawing Tools for the Dollar

HANDS ON
by Rick Miller

Anyone who uses graphical applications needs a simple, straightforward drawing tool for sketching diagrams, creating logos, and customizing clip art. And in this race, Micrografx's *Windows Draw*—the latest version of what was once *Draw Plus*—wins by a mile.

Jazzed up with a brand-new interface and an extensive clip-art collection, *Windows Draw* gives you just the right combination of functions and benefits without the frills. And with its bargain list price of \$149.95, it's a painless addition to your collection of tools.

Windows Draw makes an able companion to just about any installation, thanks to its comprehensive list of import and export filters. Its native format is Micrografx's own .DRW format, which is supported directly by *PageMaker*, and you can read and write files in a wide range of other formats: .WMF, CGM (in several flavors), .WPG, .DXF, HPGL, TIFF, .PCX, and .BMP.

Windows Draw's ability to both read and write editable EPS files in the versatile and stable .AI format (an increasingly popular format for third-party clip art) is fairly unusual in a low-cost graphics package. Given the complexities of vector formats, though, its export filters can't be (and are not) perfect. I had some trouble exporting CGM files with text fonts, for instance. But in today's mix-and-match world of file formats, this wide set of options is enormously useful.

For such a low-cost package, *Windows Draw* provides very full-featured drawing and editing tools. Its complete Bezier-curve tools are flexible and easy to use: You can draw single and multipoint curves directly, or convert sketches or polylines to smooth Bezier curves after

the fact. You can add Bezier nodes and manipulate control points. Combined with the ability to open and close shapes, these features give you everything you need to reshape, combine, and customize clip art.

Similarly, the program's skew and object-blend tools come in handy for creating realistic pictures. And its superb interactive rotation functions and other text skills (you can control leading and kerning interactively, convert text to objects, and even fit text along a curve) make it perfect for creating logos.

The program comes with four outline typefaces from Bitstream and supports all *Windows*-type managers plus Bitstream and Nimbus Q font outlines. You can create and save your own color palettes and use several styles of gradient fills.

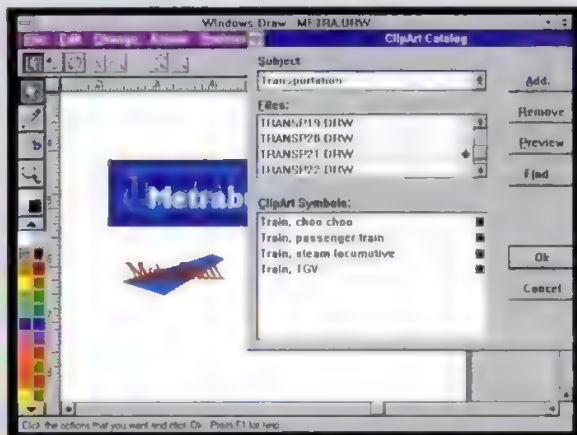
The revamped interface is a major improvement, especially considering that Micrografx's high-end drawing product, *Designer*, has a reputation for having a tough-to-decipher interface. The drawing screen gives you an image of your page, with dimensions taken from the

printer driver and your margin settings. You select major functions (select, draw, text, zoom, and attributes) in an icon panel on the left; the icon bar at the top then changes to reflect the options that are pertinent to your selection.

A help line at the bottom of the screen helps you figure out each icon and function; the cursor changes shape to indicate your current operation. It's a rich but clean and simple working environment.

Windows Draw does have a few awkward points: It's not always obvious whether you're applying a fill, line, or background color, for instance, and it could be more intelligent about returning to the pointer tool in some places. But the use of icons makes the menus simple and easy to remember, and there are plenty of keyboard shortcuts (indicated in the information line at the bottom of the screen) for common operations.

Its text-edit button, which lets you jump right into editing any selected piece of text, is an enormous convenience; one only wishes for a similar button to toggle the snap status.



Windows Draw's well organized clip art collection contains over 2,600 Micrografx images. You can browse by subject, do key word searches, or preview images.



FACT FILE

Windows Draw, Version 3.0
Micrografx, 1303 Arapaho,
Richardson, TX 75081; 800-
733-3729, 214-234-1769.

List Price: \$149.95; upgrade
from *Draw Plus*, \$79.95.

Requires: 286-based PC or
better, 1MB RAM, hard disk,
EGA graphics adapter or
better, DOS 3.1 or later,
Microsoft Windows 3.0,
mouse.

In Short: With a well-selected
group of high-end features at a
low-end price, Micrografx's
Windows Draw is a must-have
accessory for business
graphics users.

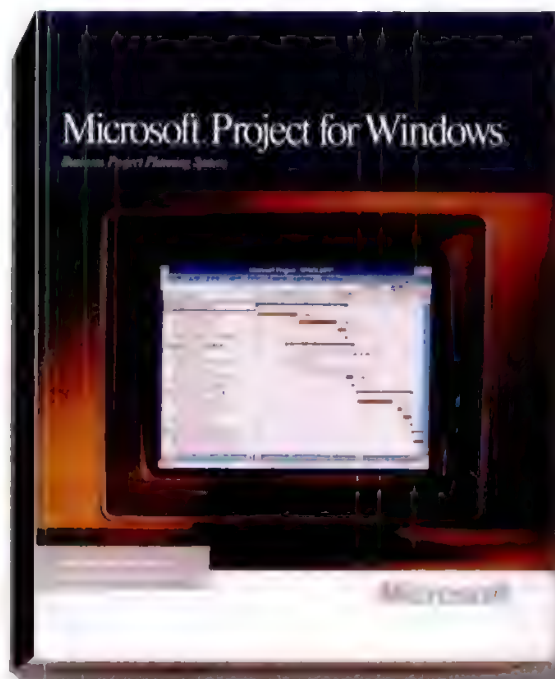
CIRCLE 700 ON READER SERVICE CARD

If *Windows Draw*'s considerable skills are not enough to win you over, its large, high-quality collection of vector-based clip art should do the trick. The program comes with over 2,600 images drawn from Micrografx's large collection, and you can select them easily from within the program using an excellent electronic catalog.

You can easily browse through the image descriptions to find what you want, previewing images of interest, or you can search the text of the descriptions for particular words. If the image you need isn't on your hard disk, you can fire up the background installation utility to retrieve the file from your distribution disks.

Though it is bargain-priced, *Windows Draw* is far from cheap. Its robust editing features, which include a number of useful high-end functions, let you handle a full range of business graphics tasks without going to the complexity and expense of a full-fledged illustration package like *CorelDRAW* or Micrografx's own *Designer*. And its comprehensive import/export functions make it far more broadly useful than its low-end competitors, *VentanaDraw* and *WinDraw*, which support only the .WMF format—and shakily at that (First Looks, October 29, 1991). Throw in *Windows Draw*'s large collection of quality clip art, and you'll find it a remarkable value. ■

Microsoft Project for Windows introduces an amazing management technique. Your own.



When you use Microsoft® Project for Windows®, just be yourself.

Because you'll have all the power and flexibility you need to manage any size project your own way.

Let's say you want to create your own filters, so you can find specific types of information. No problem.

And if you've ever wanted custom tables and fields that allow you to view and report data any way you want, relax, now you have them.

There's even outlining to create customized reports, tailored to your audience,

showing only the level of detail you want.

And you can do all this with the same project manager *PC Week*, *PC Magazine*, *PC World* and *Software Digest* call the best in its category.

If you would like more information on Microsoft Project for Windows, or a working model for \$9.95*, call us at (800) 541-1261, Dept. V29. We won't tell you how to do your job. We'll just help you do it.

Microsoft®

* Applicable sales tax, shipping and handling not included. Offer good only while supplies last and only in the 50 United States. When ordering the working model, inquire about specific system requirements. In the 50 United States, call (800) 541-1261, Dept. V29. For information only: In Canada, call (800) 563-9048; outside the United States and Canada, call (206) 936-8661. ©1991 Microsoft Corporation. All rights reserved. Microsoft and the Microsoft logo are registered trademarks and Windows is a trademark of Microsoft Corporation.

The new UltraLite III. Is it a notebook, a desktop or a portable? Yes.



*Did you know that NEC
makes a wider range of
computer products than
anyone in the industry?*

*From one of the
world's smallest and
lightest notebooks,
to the world's
fastest
supercomputer.*

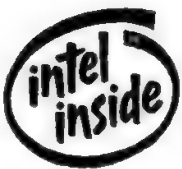
Our UltraLite® III is
one of the best per-
sonal computers you can buy. In fact,

it's *three* of the best personal
computers you can buy.

■ *First, the UltraLite III, when it's a note-
book*, weighs just 4.8 pounds and
measures a super-thin 1.5" x 9" x 11.5".
It has 2MB of RAM (expandable to
10MB), a crisp, bright VGA screen,
60MB hard drive and 386SX processor
running at 20 MHz. It also has a broad
range of connectivity features, including



At 4.8 pounds, it's one of the smallest, lightest 386SX notebooks around.



C&C
Computers and Communications

serial and parallel ports, a Super VGA CRT port, a mouse port, and an optional internal modem or fax modem. Not to mention an optional external battery slice for a total of over five hours of power. All of which permits it to perform feats far beyond the reach of ordinary notebooks, far from home.

■ *Second, when it's a desktop*, it is a very high-performance machine indeed, delivering full desktop capacity. Nestled in its optional docking station, the UltraLite III gives you even more computing power. It can accept up to two AT[™] cards, and its standard 5¼" drive bay can house a hard or floppy drive, CD-ROM reader, tape backup or other storage device. Allowing you to build the exact computer system you need.

■ *Third, when it's a portable PC*, it's about as portable as you can get. Combined with its docking station, it weighs under 15 pounds and is comparable in size to most laptops. So you can set up your office whenever and wherever you need it.

The UltraLite III comes ready to run with MS-DOS[®] 5.0 and Windows[®] pre-installed. It also gives you something you can't get from anyone else, at any price: NEC. Fact is, NEC not only invented the notebook PC, we invented the docking station, as well.

For more information, call 1-800-NEC-INFO. Or call NEC FastFacts 1-800-366-0476, #ULITE3 (854833) for literature. The new UltraLite III. The answer to your every computing need.



It's a powerful 386SX desktop PC.



It's a portable PC, so you can take your desktop computing anywhere.

Because  is the way you want to go.

NEC

Opta's MonaLisa: True Color Plus Compression Is Something to Smile About

by M. David Stone

Photo-realistic 24-bit color is stunning, but beauty has its price. True color images can chew up vast amounts of disk space. The \$1,995 OPTA MonaLisa Display Board is one of the first 24-bit graphics boards to offer a solution by combining image-compression technology with 24-bit color on a single board.

The MonaLisa board can display an image with color and apparent resolution that rivals the original images. With 24 bits per pixel, you have nearly 17 million colors available—as many as the human eye can see, and lots more than the number of pixels on-screen.

But at 24 bits per pixel, a scanned 2-inch by 2-inch photo at 300 dpi delivers 360,000 pixels (600 by 600). At 3 bytes per pixel, that's a 1MB file to store. With a 4-inch by 4-inch photo, the number of bytes quadruples and the image occupies about 4MB—an almost prohibitively large amount of memory if you plan to store a lot of images.

OPTA's compression solution consists of an optional \$995 compression board that occupies a second slot in your PC and is connected to the MonaLisa board with a short ribbon cable. The compression board is built around C-Cube's hardware implementation of the JPEG

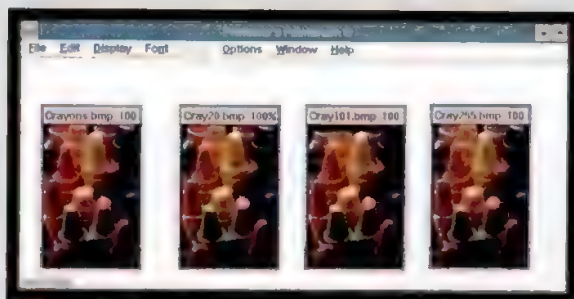
(Group) compression algorithm.

The JPEG compression scheme is intended for use with images, so unlike text compression schemes, it is not completely "lossless"—although the loss of image detail is negligible. As the illustration on this page demonstrates, you have to lose a lot of information before there is a noticeable effect on picture quality.

OPTA's compression software utility lets you specify a quality (or Q) factor between 8 and 255 that is directly related to the amount of compression—and consequently the amount of image degradation—though the compression ratio varies from one image to another. The loss of quality in an image will vary depending on the information the image contains—detail, color, line shape, and the like.

A Q factor of 20 is virtually indistinguishable from the uncompressed image. A 101 Q factor shows some loss of quality on screen, but actually so little that it may not translate to the printed page, depending on the print technology you're using. A 255 Q factor shows an obvious loss of quality with little extra disk space gained, as shown by the table below.

While there are a number of boards that support 24-bit resolutions, the MonaLisa Display Board is one of the first to support 24-bit color at all three of the current most popular resolutions: 640 by 480, 800 by 600,



You may not be able to see a difference in these shots, in part due to the artifacts introduced during the printing process, but these four pictures show the same image after different levels of compression. From left to right, the images are shown not compressed, and then compressed with quality factors of 20, 101, and 255, respectively. You'll notice that there is a blurring of the edges and some color shifting in the Cray255.bmp image.

and 1,024 by 768 (in both interlaced and noninterlaced). The board comes in two versions, with either 2MB or 4MB of on-board VRAM. The \$1,675, 2MB version allows a maximum resolution in 24-bit color mode of 640 by 480 pixels. For the full range of resolution up to 1,024 by 768 with 24-bit color, you need the 4MB version as reviewed here, and unfortunately there is no way to upgrade from 2MB to 4MB.

A Tseng ET-4000 chip provides the MonaLisa's 16- and 256-color capability; the 24-bit color relies on a TI 34020 graphics coprocessor. You can also add up to 4MB DRAM to the TI chip for additional TIGA program space and display lists. The 2MB version of the board comes with 1MB DRAM for the TI chip as standard; the 4MB version has no DRAM for the TI chip, although both boards use a separate 512K of DRAM for the ET-4000.

On PC Labs Performance Tests, the board proved a little sluggish compared to standard VGA boards, but the differences were minor—a small price to pay for the 24-bit color.

As you might expect given all this hardware, the MonaLisa is a full-length card. It will work in either a 16-bit or an 8-bit slot, though a 16-bit slot is highly recommended. The setup program lets you set it for 8-bit or 16-bit operation, with 8-bit op-

eration standard as shipped.

There are one or two bugs in the package. In particular, if you open a full-screen DOS window while using any of the 24-bit drivers, you will often crash when you move back to a Windows program. (This problem stems from the memory location you set to use with the board.) Also, the installation is less smooth than it optimally could be; however, these are small flaws in an otherwise excellent package. The original Mona Lisa wore a smile; this MonaLisa board could help you wear the smile.

MONALISA'S COMPRESSION: HOW Q FACTOR AFFECTS IMAGE SIZE

Q factor	Image size (bytes)	Compression
0	96,118	None
20	7,908	12 to 1
101	3,584	55 to 1
255	1,720	114 to 1



FACT FILE

MonaLisa Display Board

OPTA, 2525 E. Bayshore Rd., Palo Alto, CA 94303; 800-274-6782, 415-354-1120

Requires: 640K RAM (4MB highly recommended); one 8-bit slot for the display board (16-bit slot recommended); one 16-bit slot for the optional compression board; DOS 3.2 or later; VGA, Super VGA, or 1,024-by-768 resolution monitor (interlaced or noninterlaced)
List Price: \$1,995 for MonaLisa Board; \$995 for compression board.

In Short: Brings true color to VGA, Super VGA, and 1,024-by-768 resolution (interlaced and non-interlaced), plus an optional compression capability.

CIRCLE 431 ON READER SERVICE CARD



Introducing Carbon Copy for Windows. Now you can point and click all over the place.



Chances are you already know a thing or three about Windows. You may also know that Carbon Copy Plus™ is the leading remote control software for DOS. But what you may not have known, until now, is that Carbon Copy is available for Windows. And that's big news.

Carbon Copy for Windows, a true Windows application, lets you use all of the Windows programs on a remote PC as if they were on your own PC. Plus you get a File Manager-like transfer utility, compatibility between different video modes, and multiple security features that protect the host PC from unauthorized access.

Most importantly, Carbon Copy for Windows provides such exceptional performance, you may forget you're not working with programs on your own PC.

So if you're looking for one package with all

the remote control software you need for communications between two Windows PCs, get Carbon Copy for Windows. And see how remote control software is starting to click.



NAME OF
Remote Control
Communications
Company

Call **1-800-822-8224**

today for complete information about Carbon Copy for Windows, including a FREE "Guide to Remote Control Communications" or complete this coupon and mail to Microcom.

Please send me: ☐ FREE "Guide to Remote Control Communications". Now for \$79.00, you can trade any version of Carbon Copy Plus or other remote control software product for Carbon Copy for Windows. Offer ends 3/31/92. Call 1-800-933-1750.

Name _____ Title _____

Company _____

Street _____

City _____ State _____ Zip _____

Telephone _____



Microcom

PCM 12/91

Technology Guides, 500 River Ridge Drive, Norwood, Massachusetts 02062-5028
(617) 551-1000, Fax: (617) 551-1021, International Fax: (617) 551-1007

Microcom is a registered trademark and Carbon Copy Plus is a trademark of Microcom Systems, Inc. Other trademarks referenced are the property of their respective owners. © Microcom, Inc. 1991. All rights reserved.

First Looks

LapLink Pro Now Offers Dial-Up File Transfer

HANDS ON
by Angela Gurm

LapLink III has been entirely reworked as *LapLink Pro*, offering file transfer and manipulation from anywhere that you can dial up a connection. Adding file transfer across modem lines, the \$169.95 *LapLink Pro* tiptoes close to the realm of full-blown remote-control software.

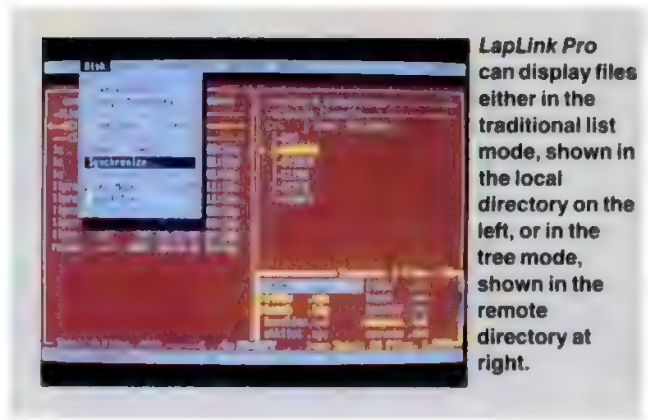
LapLink has a dialing directory and simple scripting (for example, external-line prefixes, or suffixes such as a credit card billing number). Unlike other comm programs, *LapLink* takes care of hardware compatibility via its Universal Communications Object module (see sidebar); it is now equipped to cope with around 60 100-percent-Hayes-compatible modems—high-speed and cellular models. And if you forgot to install the program before you left the host computer, *LapLink Pro* can remotely install itself with minimal work from a friendly typist on the host side. Password protection is available.

Once connected, *LapLink Pro* is speedy and convenient. File transfers are quick; progress is shown by a percentage

bar and by a total-byte tally. Compression capabilities are built in. If you need an application on your local machine during a session, you can shell to DOS, disconnecting and leaving a minuscule 1K TSR until you're ready to go back.

One of *LapLink Pro*'s nicest features is Synchronize, which reconciles drives on connected PCs. Same name files are compared and the earlier version is overwritten by the later version; files that have no match are copied into the directory that lacks them. You can limit the scope of this update by running a more limited Synchronize search. Individual files can also be marked for copying. Overwrite confirm and other options are available.

You can write batch files for commonly used routines, such as updating a set of files. If you need to edit or write an ASCII file, there's a simple but useful text editor that includes a large type mode and a Clipboard. Files can be moved or copied



LapLink Pro can display files either in the traditional list mode, shown in the local directory on the left, or in the tree mode, shown in the remote directory at right.

between local and remote computers; directories and subdirectories can be created, renamed, or deleted. It's also possible to clone entire drives (deleting the information on the target drive), which is dangerous power to put in the hands of the unwary, but useful for a network manager.

Traveling Software has improved the user interface, making it easier to tell which computer you're on at a given moment. The traditional split-screen listing shows the connection tree, from the type of connection to the subdirectory you're looking into. A quadrant-style tree setup is also available. *LapLink Pro* has pull-down menus and is mouse-compatible. The variety of screen

color choices, including some guaranteed to frighten squeamish onlookers, is a nice touch. Documentation is excellent.

A few remote-control features aren't available: There is no means by which the remote computer can use applications on the host, and there is no way of "locking" the keyboard of the host computer—thus leaving it open to unwanted exploration. Also, Traveling Software has excised the option (available on *LapLink III*) to use peripherals on the host machine; if you want to print you'll have to wait until your session is over. But for the user who needs to schlep files to and fro, and wants latitude on the "fro," *LapLink Pro* is powerful stuff. ■

UCO TECHNOLOGY SHELTERS USERS

Anything that keeps end users from thinking about how connectivity works is probably a good thing. Traveling Software's UCO (Universal Communications Object, code-named Blackbird) is designed to mitigate user concern with details such as modem configuration and even the type of platform on which the linked PC machine is running. An independent communications kernel, UCO has been implemented in *LapLink Pro* and the Traveling Software products.

UCO was designed as an independent module to be plugged into any application, or even into hardware

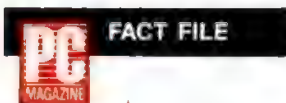
configurations. (In theory, then, transfer software per se could be circumvented entirely; your database program, if properly written, could move its own data from place to place.) It's also platform-independent, thus providing connectivity over such sworn enemies as DOS, OS/2, Unix, and Windows.

UCO works at the bottom four layers of network capability—physical, data-link, network, and transport—behaving as gatekeeper, channeler, and data pump. It recognizes the hardware to which it is speaking and optimizes its transfer for that system; that

is, it does the work of figuring out parity, stop bits, and so forth. It then informs the application of its findings.

If in the course of file transfer the connection is broken (by something other than the user), UCO automatically works to reestablish the severed link. Error correction also occurs, transparently to the user.

UCO is not a standard, nor was it meant to be. However, Traveling Software has already licensed the technology to Slate Corp., which manufactures pen-based applications software, and expects to announce more agreements as time goes by.—AG



LapLink Pro
Traveling Software, Inc., 18702
North Creek Pkwy, Bothell, WA
98011; 800-343-8080, 206-
483-8088.

List Price: \$169.95.
Requires: 440K RAM on each
machine (220K for remote
installation); serial or parallel
port, or telephone connection;
DOS 2.11 or later, Hayes-
compatible modem.

In Short: *LapLink Pro* breaks
the boundaries of simple file
transfer with its ability to
connect to a host computer via
modem. A smart set of file-
maintenance options make it an
essential package for travelers.

CIRCLE 708 ON READER SERVICE CARD

PC Magazine caught us speeding.

"PacificPage XL beats HP on LaserJet PostScript printing"

PC Magazine, June 25, 1991

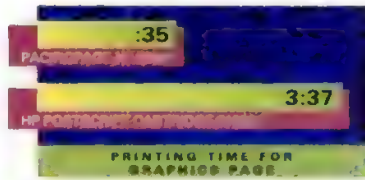
FASTEST PRINTING SPEED. LOWEST PRICE.

PacificPage XL is fast. So fast, that PC Magazine has cited it for exceeding the speed limit of Hewlett-Packard's PostScript® Cartridge by more than six times.

If by chance the speed doesn't sell you, the low price will. Because it's the one feature of PacificPage XL that doesn't exceed HP's cartridge.*

How do we get it to work so fast? It's really quite simple. We've taken our award-winning PostScript language emulation cartridge called PacificPage P•E, and combined it with a high speed accelerator board that installs easily into your LaserJet IIP, III, IIID or IIIP printer memory slot. LaserJet printing speeds are boosted by the fast Intel 1960™ RISC processor that's mounted on the board alongside 2 MB of printer memory.

"An Intel 1960 RISC processor on the accelerator board helps the PacificPage XL print graphics more than six times as fast as the HP PostScript Cartridge."



"PacificPage XL provides the fastest PostScript printing available on a desktop."

Do you use a shared printer? If you do, you'll definitely want the speed of PacificPage XL. Because output is printed so fast, other users won't have to wait for their jobs to print.

Make a quick price/performance comparison and you'll see — PacificPage XL is the smart choice!

35 POSTSCRIPT COMPATIBLE FONTS

Acquiring stylish, professional looking output is easy with PacificPage XL. Because we've included 35 fully scalable Apple LaserWriter equivalent fonts. These high quality Bitstream designs provide you with the tools you need to create output that shines. For even greater versatility, PacificPage XL supports Bitstream's Speedo fonts and Adobe Type 1 and 3 fonts.

COURIER
SWISS
SWISS NARROW
DUTCH
ZAPF
CALLIGRAPHIC
GEOMETRIC
REVIVAL
CENTURY
CHANCERY

Zapf Dingbats
**0%✓*+@♦

Symbol
←△ΦΓ∞Y'NX*

Each typestyle comes in normal, bold, italic and bold italic treatments except for Chancery, Zapf Dingbats, and Symbol.

"The native 35 PostScript compatible fonts in PacificPage XL are Bitstream designs, some of them superior to Adobe's version."

100% POSTSCRIPT LANGUAGE COMPATIBILITY — GUARANTEED

Many LaserJet users believe that only true Adobe PostScript gives true PostScript capabilities. The truth is, PacificPage XL provides exactly the same graphics



"PacificPage XL swiftly and accurately renders some test EPS files that other interpreters distort and had no trouble with any of the large and complex images used for testing."

capabilities for your LaserJet as Adobe PostScript. Exactly. So you can pay less and, in addition to speed, get all of PostScript's powerful graphics functions. We're so sure of it that we give you our money back guarantee of satisfaction.

FREE DESKTOP PUBLISHING KIT

Call for your free introductory kit which includes: *The PC is not a Typewriter* (\$9.95) from Peachpit Press, a book to help you create professional-looking documents; a point size ruler, plus valuable offers on our products.

Quantities are limited. So call now! For more information or a dealer near you, contact Pacific Data Products, (619) 597-4608.



* Suggested list price effective 8/15/91 and includes the cost of 2 MB of memory. Quotes reprinted from PC Magazine, June 25, 1991. © 1991 Ziff Communications Company. PacificPage XL and PacificPage P•E are trademarks of Pacific Data Products, Inc. Adobe and PostScript are registered trademarks of Adobe Systems Inc. HP and LaserJet are registered trademarks of Hewlett-Packard Company. 1960 is a trademark of Intel Corporation. All other product, company, and typeface names are trademarks of the company or manufacturer respectively. Pacific Data Products Inc. 9125 Rehco Road, San Diego, CA 92121, Fax (619) 552-0889. EUROPEAN OFFICES: Geneva Tel (41) 22.41.26.50, Fax (41) 22.41.06.82, France Tel (33) 1 39 23 20 00, Fax (33) 1 39 63 31 20, U.K. Tel (44) 442 23 14 14, Fax (44) 442 23 65 40. © 1991 Pacific Data Products, Inc.

PACIFIC
DATA PRODUCTS

First Looks

Actor 4.0 Matures with Safe Inheritance, SQL Classes, And Graphics

by Howard Hulse Chase

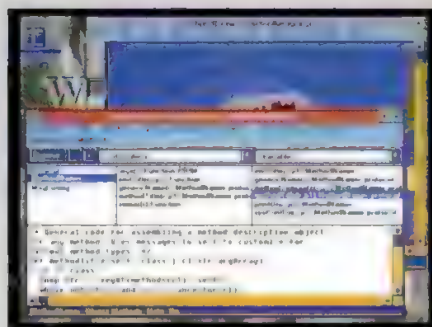
Actor is an object-oriented development environment that lets developers access the full power of the Windows GUI without having to use the Windows SDK or resort to C, C++ or Pascal.

Actor 4.0 (\$249) is a revision that features a "protocol" facility for safe inheritance in derived classes, a Windows Description Language for creating GUI interfaces, and "Action methods" that you can easily associate with Windows messages. For \$495, *Actor Professional* adds ObjectGraphics (a graphics class library), the Whitewater Resource Toolkit for designing Windows resources, and an object-oriented

SQL library.

The biggest news is Actor's "protocols" (see sidebar). But also, *Actor Professional* 4.0 now has Pioneer Software's comprehensive SQL-based database class library. The library provides Actor classes to access dBASE (II, III+ and IV) and Paradox tables on a read-write basis, as well as read-only access to Microsoft Excel and ASCII text files. The classes access the files via dynamic link libraries (DLLs) supplied with Actor. For a bit more, Whitewater provides DLLs to access IBM DB2, Microsoft/Sybase SQL Server, NetWare SQL, Oracle Server, and OS/2 Extended Edition Database Manager.

The SQL classes use a simple object hierarchy. One class



Actor 4.0's Protocol Browser makes protocols accessible. ObjectDraw (written in Actor and ObjectGraphics) is running in the background.

maintains the relationship between Actor and the database system, and the other classes let your applications issue SQL commands against the database, access the columns of each table, and access database views. In addition, the database library provides functions for connecting to a database, executing SQL commands, defining new tables, retrieving data, transaction control, data conversion, error-handling, and debugging.

Both versions of Actor offer a Window Description Language (WDL) and an Attribute Browser. The WDL defines the visual appearance as well as the behavior of the windows, dialogs, controls, and menus in your program's interface, using simple English syntax. For example, "Window accounts" creates a window called "accounts," followed by the window class name and title. WDL statements can be stored in simple text files and provide a number of default values. You can use the Attribute Browser to interactively create and test WDL definitions.

You'll still want to use the Whitewater Resource Toolkit (available only with *Actor Professional*) to create static resources, particularly complex ones. But with WDL, you can create your application's windows and controls interactively, testing and modifying them as you go.

In the past, there has always been some confusion over which methods will be triggered when an Actor application receives a Windows message, and how to trigger a specific method. "Action methods," another

powerful addition to Actor 4.0, makes this simple. These are Windows response methods that let you specify a Windows message ID (as well as an accelerator key) in their description.

Actor Professional 4.0 also features ObjectGraphics, an object-oriented graphics library, and ObjectDraw, a graphics and drawing program written in Actor 4.0 and ObjectGraphics.

Actor has always had the misfortune of being pigeonholed as a hard-core tool, one that required more work than environments like Asymetrix's ToolBook or Knowledge Garden's KnowledgePro Windows. It has been accused of placing too many layers between Windows and the developer. But at the price of some incompatibilities with previous versions of Actor, the addition of Action methods, WDL, the SQL library, and protocols establishes Actor as a complete, mature product that is robust enough to consider as a first-choice Windows-based, object-oriented environment. ■

AVOIDING CLASS CLASHES

Like many other OOP languages, Actor lets you create new (child) classes that derive all the features and facilities of other (parent) classes via multiple inheritance.

With other languages, however, you run a risk: If the parents of a derived class have methods or instance variables with the same names, they may clash. And unless you explicitly reference them, there's no way to know which method or instance variable is being used. Plus, if you don't adhere to privacy conventions when designing your classes, their data can be changed by any class in its ancestry.

Protocols are Actor's solution. They're *classless* methods that can be used by any class via "subscription." Essentially, protocols decouple data from meth-

ods. Unlike standalone functions, protocols can still access the data of the calling object's class, because in a protocol, a "self" (the "this" pointer in C++) is still available, and refers to the object calling the protocol.

Consequently, protocols let you add functionality to a class without necessarily using multiple inheritance. Instead, you build a set of skills into the protocol; any class that needs them can use them. Since protocols carry no instance data, there's no possibility of running into typical problems of multiple inheritance.

Some of Whitewater's rationale for safe inheritance involves scare tactics that I don't entirely buy. Nevertheless, protocols are a clever idea. —RHS ■



FACT FILE

Actor, Version 4.0
The Whitewater Group Inc.,
1800 Ridge Ave., Evanston, IL
60201; 800-869-1144.
List Price: \$249; *Actor Professional* 4.0, \$495
Requires: 2MB RAM, 7MB hard disk space, Windows 3.0 or later, mouse.
In Short: Actor 4.0 adds important features to its maturing OOP Windows development environment.

CIRCLE 79 ON READER SERVICE CARD



Our New Departmental PostScript Printer Is So Efficient, You Might As Well Say It Prints Money.

1991
Increased office efficiency
results in increased profitability



Efficiency – The QMS Watchword Of The '90s

Maintaining one high-duty printer rather than 30 to 40 desktop printers is a cost advantage. That's good. But the real advantage comes when the speed, intelligence and flexibility of the new QMS-PS® 2000 changes an office cost advantage into a departmental profit center!

Easy Connectivity In All Popular Business Environments

The QMS-PS 2000 is perfect for mixed computing environments. It connects easily to EtherNet® or Token Ring® networks to accept TCP/IP, DECnet®, LAN Manager, NetWare® and EtherTalk™ protocols.* Whether your network includes IBM® PC's and compatibles, Macintosh®, DEC® or UNIX® systems, the QMS-PS 2000 is your most efficient solution. It features AppleTalk®, RS-232C serial, Centronics®/Dataproducts® parallel and network interfaces that accept data simultaneously. That means the 2000 can easily serve large, multi-system networks. Its advanced spooling capability virtually eliminates workstation waiting time by storing each document as it's received and printing each in turn. And the 2000 does all this automatically to save time!

True Adobe PostScript Flexibility Plus Automatic Emulation Switching

Now departmental documents can have personality thanks to the 2000 and Adobe® PostScript®. Forty-five resident fonts can be scaled and rotated for effective charts and graphs. And because PostScript is the industry standard, you'll have thousands of useful applications at your fingertips. Switching to non-PostScript applications is literally automatic. QMS's exclusive ESP® technology (Emulation Sensing Processor) interprets incoming data and automatically chooses the appropriate printer language. PostScript, HP® LaserJet® IIP, HP-GL®, LN03® Plus and other emulations are recognized automatically!



Worldwide Service And Support

QMS® is recognized as the leader in advanced PostScript printing technology. Free technical support and our network of service experts are standing by.

Call today and find out how the time-efficient, cost-efficient QMS-PS 2000 can be a departmental profit center for your company. Or FAX QMS Product Information at (205) 633-4866.

Features That Add Up To Lower Per-User Cost

- MIPS R3000 RISC-based internal controller for super-fast page processing
- 8 MB RAM standard, expandable to 16 MB
- 1.44 MB, 3 1/2" floppy drive to load fonts or emulations into RAM or onto hard disk
- QMS proprietary ASAP™ IV technology speeds PostScript processing time
- 20 pages per minute
- 70,000 plus page-per-month duty cycle
- 1500 sheet input and output capacity
- Letter-/A4-, legal, 11"x17"/A3- and executive-size printing capabilities
- Duplexing feature prints on both sides in one pass
- Easy-to-read, multilingual LCD front panel to easily configure printer
- Document handling features include tumble printing, collation, offset stacking and automatic jam recovery.



CIRCLE 141 ON READER SERVICE CARD

1-800-523-2696 EXT. 34

QMS

Where Imagination Leads

The following are trademarks or registered trademarks of their respective companies: QMS, QMS-PS, ASAP, and the QMS logo of QMS, Inc. Adobe and PostScript of Adobe Systems, Inc. EtherNet of Xerox Corp. IBM and Token Ring of International Business Machines Corp. AppleTalk, EtherTalk and Macintosh of Apple Computer, Inc. NetWare of Novell, Inc. DEC, DECnet, and LN03 of Digital Equipment Corp. HP, LaserJet, and HP-GL of Hewlett-Packard Company. Centronics of Centronics Data Computer Corp. Dataproducts of Dataproducts Corp.

*Contact QMS for availability of network options.

*Patent pending

First Looks

PackRat's Back with Smarter PIM Features

HANDS ON
by Barry Simon

PackRat may now be the ultimate PIM. Polaris Software's newly released \$395 Version 4.0 adds Action and Smart Buttons to automate usage, and Contact and Things To Do lists for quick access to urgent items.

The structure of this *Windows*-based personal information manager is unchanged from Version 3.0. The 13 facilities from the *PackRat* icon bar include: Phone/Address list, Phone Log, To Do List, Appointment Calendar, Check Tracker, Index Cards, Disk File List, Resource Tracker, Project Manager, Time & Billing Module, Alarm Module, Global List, and Scratch Pad.

PackRat's ability to link items lets you use the Disk File List to track *Word for Windows* documents pertaining to an individual listed in your phone book. A user-defined Smart Button brings up a list of all the letters linked to that person. Click on the built-in Action Button and *PackRat* will automatically launch *Word for Windows* with the chosen document.

These new Action Buttons include four predefined buttons to handle functions that are common to all facilities: add, delete, search, and attach. Three other Action Buttons handle common routines: logging incoming and outgoing calls and launching a program from the disk file facility.

There are also eight user-defined Smart Buttons for automating tasks. You define a Smart Button by selecting an icon from a supply of about 70. Then, you specify which facility to use, and which actions from printing and phoning you'd like the Smart Button to perform.

PackRat has five sample Smart Buttons for calendar printouts, but you can define your own to perform tasks such

as listing items attached to the currently highlighted item or printing envelopes for address book entries. I only wish the program had more than eight Smart Buttons and could use imported icons.

The new Things To Do list displays items that are past due or due today; the new Contact list reminds you of the calls you should make. *PackRat* even lets you indicate an attempted but incomplete call by adding the name to the Contact list.

You can customize reports with the full array of *Windows* fonts. The program supports dynamic data exchange (DDE) and ships with macros to link it to *Word for Windows*, *Ami Pro*, and *Excel*. There are also links to the Sharp Wizard. A

network version with e-mail and group tracking is expected to ship by the time you read this.

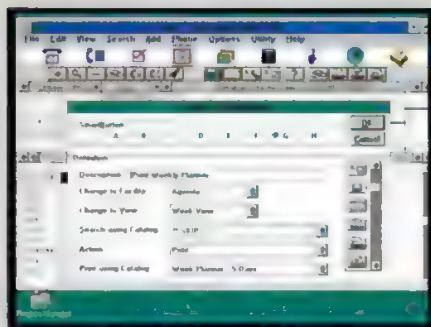
PackRat is intelligently and carefully crafted, but it is not without its flaws. The Financial Manager, a pale imitation of a full-fledged financial program, is missing check-printing and budgeting. And you can't edit a recurring event in the project management facility.

PackRat is somewhat pricey compared to other *Windows*

PIMs, but its superb job of integrating calendar scheduling and contact management puts it in a league by itself.

List Price: *PackRat*, Version 4.0, \$395; \$49.95 for upgrade; \$695 for three-user network version. Polaris Software, 1820 Escondito Blvd., #102, Escondito, CA 92025; 800-338-5943, 619-743-7800. **Requires:** 1MB RAM, DOS 3.1 or later, *Microsoft Windows 3.0*.

CIRCLE 448 ON READER SERVICE CARD



A near-perfect PIM for the three P's: projects, people, and phones. *PackRat* 4.0 uses an icon bar and pre-programmed Action and user-defined Smart Buttons.

Quarterdeck Gives 386MAX Users Solid Upgrade

HANDS ON
by Barry Simon

The market for 386 memory managers has been in turmoil since DOS 5.0 moved in with memory management capabilities of its own. While DOS 5.0 gives users the basics, it also makes them realize they may want more. Quarterdeck Office Systems recently upgraded *QEMM*, Helix Software introduced a new *NetRoom*, and there are even several new entries. Qualitas, the original groundbreaker in this area, has released the \$99.95 *386MAX*, Version 6.0, in response to these developments.

TSR junkies desperate for every last byte of upper memory block (UMB) space to load drivers and resident software won't find as much in this upgrade as in the new *QEMM* 6.0 or *NetRoom* 2.1, but *386MAX* does offer some help. First, it will optionally move the VGA ROM to the memory area used by mono-

chrome displays. This provides no gain in UMB space, but by closing a hole, the space is used more efficiently.

Second, *386MAX* automates the search for "dead" system ROM. On many systems, the first 32K of system ROM is used only for diagnostics and boot-up and can be mapped over with TSRs after boot-up. The new *386MAX* checks for this possibility during installation and will automatically use available space.

The new version provides a pool of extended memory you can use for XMS, EMS, or raw extended memory. *QEMM*, *NetRoom*, and V Communications' *Memory Commander* have done this for some time, but *386MAX* carries it a step further. While the other programs only support protected-mode programs that use the VPCI standard, *386MAX* also supports DPMI. For now, DPMI support matters mainly for running Borland's Turbo Debug-

ger, but it's bound to become more important since *Windows* and OS/2 2.0 allow DOS programs to access protected mode only with DPMI.

386MAX shines in ease of installation and use. Version 6.0 includes ASQ 2.0, a superb system diagnosis program with an extensive tutorial on memory. There's an editor that lets you pick *386MAX* options from a menu, and installation is technically sophisticated.

386MAX, Version 6.0, doesn't offer enough to tempt a user of competing standalone packages, but it will be warmly welcomed as an upgrade. New users who don't need to wring out every byte of UMB space should consider *386MAX* for its ease of use and for Qualitas' excellent support.

List Price: *386MAX*, Version 6.0, \$99.95; *BlueMax*, \$124.95; upgrades, \$29.95. **Requires:** 386- or 486-based PC or 286- or 8086-based PCs with C&T or LIM 4.0 hardware. Qualitas, #1386, 7101 Wisconsin Ave., Bethesda, MD 20814; 800-676-0386, 301-907-6700.

CIRCLE 449 ON READER SERVICE CARD

File Edit Worksheet

(C0) [W12]

A:E10

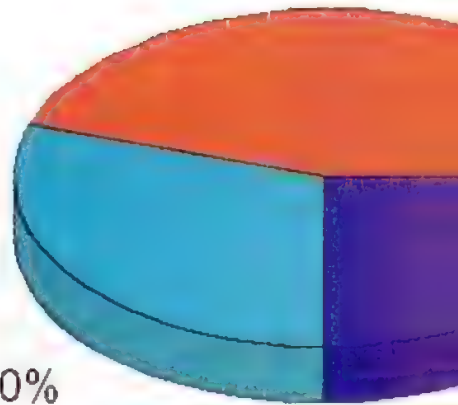
@SUM(B

	A	B
9		
10	Revenues	\$1,260,000
11	Costs	\$850,000
12	Profit	\$410,000



Market Share

45.0%



30.0%

Attn: Newsstand Readers!

We can ship selected ZEOS
Windows systems WITH the Lotus
bundle to you IMMEDIATELY. Call
800-423-5891 now for details!



1-2-3 for Windows



Amipro



WinRIX-DCS



1-2-3[®] for Windows

Now included in every



For a limited time only, ZEOS Windows systems buyers will also receive Lotus 1-2-3 for Windows plus Ami Pro 2.0, the Lotus Word Processing package for Windows. Complete and fully documented!

Your new ZEOS Windows system includes Microsoft Windows Version 3.0 plus a genuine Microsoft Mouse.

Unbelievable? Believe it! Because now, when you buy any new ZEOS Windows[®] system, you will also receive Lotus 1-2-3 for Windows plus Lotus' new word processor for Windows, Ami Pro[™] 2.0 at no additional charge!

It's the ultimate bundle! First, you're going to be receiving the incredible new ZEOS modular system complete with the upgradable CPU of your choice. These new ZEOS systems are the hottest computers money can buy. And that's just for starters.

Because you're also receiving the hottest software money can buy. Yet you don't have to buy it. Because we're including it at *no additional charge*. Go ahead and pinch yourself, it's really true!

And not only are you receiving the *amazing* new Lotus 1-2-3[®] for Windows and Ami Pro 2.0, you're also getting Microsoft[®] Windows itself, plus a genuine Microsoft Mouse plus Microsoft DOS 5.0. All included at one low package price.

These are not some scaled down versions or trial disks either. They are the *complete* and *fully documented* editions of Lotus 1-2-3 for Windows and Lotus Ami Pro 2.0 for Windows provided to you by special arrangement between ZEOS and Lotus. This is one incredible value that no one else can offer. You're going to love it, too.

Because nothing else brings out the power of the most powerful software like your blazing new ZEOS system. And when you strap your-

plus Ami Pro[®] 2.0!

ZEOS Windows System.

The foundation of your new ZEOS Windows system is the computer itself. You'll get an upgradable processor module, super-fast 53ns DRAM, a 300 Watt power supply, and lots of bays and slots for future expansion. The hardware simply can't be beat.



Wrap your Windows system up with the latest and greatest DOS version, Microsoft DOS 5.0! Fully featured and fully documented. You're going to love it!

self in and fire up *Windows* with *Lotus 1-2-3* and *Ami Pro*, you're in for the ride of your life!

After all, nobody knows spreadsheets better than Lotus. And when they sat down to write *1-2-3 for Windows* they created a masterpiece. It starts out as a full-fledged *Windows* application. Offering that perfect balance of power and simplicity, it remains fully compatible with all the earlier versions of *1-2-3*. And it's absolutely loaded with new features.

Power, Simplicity, complete Compatibility *plus* loads of new features. It's *Lotus 1-2-3 for Windows* and it comes with every ZEOS Windows system. And so does *Ami Pro 2.0*!

After all, *Ami Pro 2.0* is the Lotus word processing program that was designed for

Windows from the ground up. Linking with a full suite of *Windows* applications *including* your new *Lotus 1-2-3 for Windows*, *Ami Pro 2.0* is perhaps the finest word processor on the market today.

Buying your new ZEOS Windows system is possibly the best purchase decision you'll ever make. Then add to it *Lotus 1-2-3 for Windows*, *Ami Pro 2.0* plus *Windows 3.0*, *DOS 5.0* and a genuine Microsoft mouse. It's an offer that can't be beat and one we simply can't offer for long. So pick your new ZEOS Windows package now and we'll include a bundle! **Call now 800-423-5891!**

Upgradable. High Performance. Low Cost. And every ZEOS Windows system comes with Lotus 1-2-3 for Windows and Ami Pro 2.0 at no additional charge. Absolutely incredible!

With ZEOS 386-25s starting at only \$1395 right thru '486-33MHz systems starting at \$1795, computing will never be the same again! And it's not just the prices that make these new systems hot. It's Performance and Upgradability as well.

**UPGRADABLE
CPU**

When we first sat down to design these new systems, we wanted computers that would *blow the doors off* anything else out there. Plus, we wanted you to be able to upgrade from one CPU to another as your computing requirements changed, *without having to buy an entirely new system*. The results?

Incredibly low cost, high performance systems so very advanced you can move freely from the '386 family of processors to the latest '486s all without a moment's hesitation.

Now, you can pick your power! Today *and* tomorrow. Choose from high speed '386-25 and 33MHz systems, either cached or non-cached, plus the '486SX and '486-33MHz with or without a secondary cache. Whichever you decide upon you know that as your computing requirements change, your processing power can change as



Upgradable.

Hot New ZEOS '386



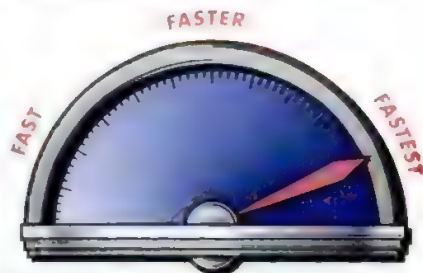
well. But are the prices really that good?

Yes. *Absolutely Yes!* The prices really *are* that good, and the quality too. Because when you buy from ZEOS you're buying directly from the manufacturer. Starting with the main system board, your new computer is designed and built by us right here in Minnesota. That saves money for you. And your ZEOS factory direct advantages are evident not only in the price, but in the performance and quality of your system too.

Not only that, but your new ZEOS system is supported around the clock by our 24 Hour a Day Toll Free technical support hotline. Should you have any questions, we're here to help, 24 hours a day, 365 days a year!

So if you're looking for a high speed, upgradable, rock solid system supported like none

other *and* you want incredibly low prices, you've found your company. And your computer. Read on!



Z • SPEED METER

To help you select the processor option that's right for you, we have developed the Z-Meter. The Z-Meter shows you the relative performance gains achieved by moving from one processor module to another—fast, faster, fastest! No matter which system you select you can be sure of one thing—these babies are Hot!

This ZEOS ad reviews each of four money saving upgradable system packages based on processor type. For a limited time only, every ZEOS Windows system includes Lotus 7-2-1 for Windows and Ami Pro 2.0 at no additional charge! Call 800-433-3691.

Low Cost.

and '486 systems!



ZEOS COMPLETE SYSTEM PACKAGE #1

- The Processor and Speed of your choice plus future upgradability!
- 1MB of High Speed 53ns DRAM, expandable to a system total of 32MB right on the motherboard.
- 42MB High Speed IDE hard drive with its own cache.
- 1.2MB or 1.44MB Teac® floppy drive.
- ZEOS 14" flat screen Hi-Res amber monitor with Tilt/Swivel base.
- Shadow RAM and EMS support for enhanced performance.
- ZEOS/RS 101 key SpaceSaver keyboard.
- Two Serial, one Parallel & one Game Port built right onto the motherboard.
- 7-16, 1-8 bit expansion slots. 80387 math co-processor support for 386 systems.
- Rugged ZEOS SpaceSaver case with twin cooling fans for added reliability and product life.
- Seven drive bays and our custom 300 Watt power supply for your future expansion!
- Includes ZEOS 24 Hour a Day Toll Free Technical Support and Customer Satisfaction package.

PACKAGE #1

INCREDIBLE ZEOS PACKAGE #2

- We take Package #1 and upgrade your ZEOS Modular System to include:
- 2 full Megabytes of Rip-roaring 53ns DRAM.
 - Our incredible 85MB IDE hard drive with its own built in cache.
 - Both the Teac® 1.2MB and 1.44MB floppy drives.
 - The awesome Diamond SpeedStar Plus VGA graphics card Complete with 1MB DRAM.
 - ZEOS 14" High Res VGA Mono Monitor with Tilt & Swivel base.
 - Lotus 1-2-3 for Windows, plus Ami Pro 2.0, plus Microsoft Windows and DOS 5.0, plus a genuine Microsoft mouse!

PACKAGE #2

ZEOS. Your



For Vertical Systems add only \$150.

Harnessing the ZEOS power and value you want is easy. Pick your processor then your package. Package #1 gets you up and running for a very reasonable price. To add even more options *and*

savings select from Packages 2, 3 or 4.

Because when you select from Packages 2, 3 or 4 you receive VGA, additional memory, larger drives and more. You also receive *Windows 3.0* plus *Lotus 1-2-3 for Windows* plus Lotus' great new *Windows* word processor *Ami Pro 2.0*, plus Microsoft *DOS 5.0* plus a genuine Microsoft Mouse. Nobody

gives you this combination of hardware *and* software power. And it's yours, all for one low package price!

And that's just for starters. Because *inside* your new ZEOS system rests the very latest advancements in surface mount, high integration technology. As an example, we have freed two normally occupied expansion slots by placing our high speed IDE hard drive and

floppy drive interfaces right on the main board. Then, we put the high speed serial, parallel and game ports on the motherboard too. The result?

Eight expansion slots, *seven* of which are available for your future use! After all, expansion and non-obsolescence are what these great new ZEOS systems are all about. We've built in some other very important expansion features for you as well.

Like our *300 watt* power supply. Providing you with all the pure clean power you'll need right now, your ZEOS 300 watt supply also provides you with plenty of power for the future as well. Plenty of slots, plenty of power. How about space? This is where ZEOS has performed something akin to magic.

It's your new ZEOS SpaceSaver case! Complete with *seven drive bays*, this incredible case is actually *smaller* than many cases offering only five bays. We've also added a *second whisper quiet cooling fan*. Why? Because whether you expand your system or not, the cooler it

486-33 \$1795

486SX-20 \$1595

386-33 \$1495

386-25 \$1395

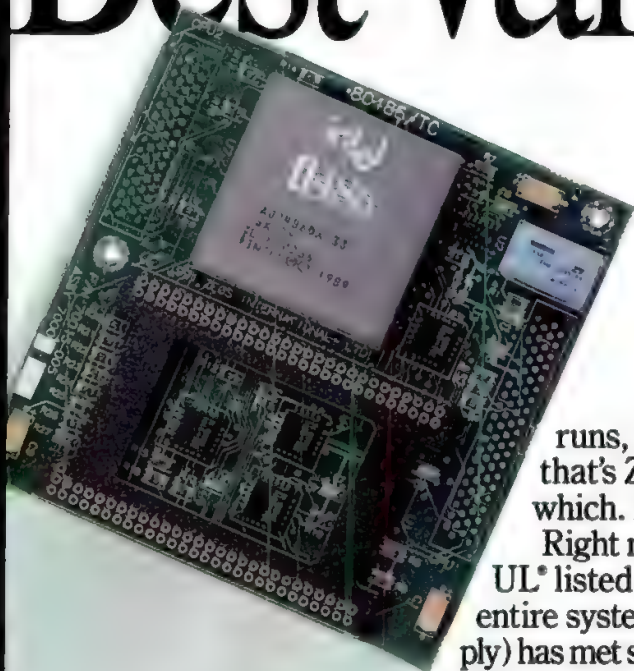
486-33 \$2395

486SX-20 \$2195

386-33 \$2095

386-25 \$1995

Best Value!



486-33 \$2895

486SX-20 \$2695

386-33 \$2595

386-25 \$2495

runs, the longer it will last. Now that's *ZEOS value*. Speaking of which. How about UL* listings?

Right now every ZEOS system is UL* listed. This listing means your entire system (not just the power supply) has met stringent safety requirements of Underwriters Laboratories. We believe

UL* listings also say a lot about quality. And UL* safety listings are something many of our competitors simply don't (or can't) provide. At ZEOS quality and safety are important to us. *You* are important to us.

Price. Performance. Quality and Support.

There are *many* reasons to buy your new ZEOS upgradable system. Plus, your ZEOS advantages include *24 Hour a Day Toll Free Support* and our *30 Day Money Back Guarantee* and ironclad warranty (for more ZEOS advantages see the section entitled "*Why ZEOS is Your #1 Choice*").

486-33 \$3395

486SX-20 \$3195

386-33 \$3095

386-25 \$2995

Selecting your new ZEOS system is easy. Choose from any of the money saving packages shown here. Or let your friendly and knowledgeable ZEOS Systems Consultant help you configure exactly what you want from our huge selection of upgrades and options. Whatever you select, one thing is for certain.

Buying your new ZEOS system is perhaps the best purchase decision you'll ever make! Simply pick up the phone and give us a call now. Incredible ZEOS power awaits you! *Call now Toll Free, 800-423-5891.*



For Complete Processor and Package Pricing, simply turn the page!

Pick Your Package

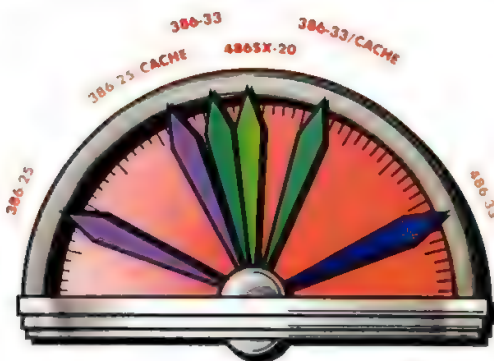
Or Let Us Custom Build to

Now, ZEOS lets you pick the power you want for the price you want to pay! Not only that, every ZEOS Windows System (Packages 2, 3 and 4) includes not only Microsoft *Windows*, *DOS* and a mouse—we're also including Lotus *1-2-3 for Windows plus* Lotus' new *Windows* word processor *Ami Pro 2.0!*

And with your new ZEOS modular system, the computer that's right for you today is also the computer that's right for you tomorrow. In the future, you can upgrade to even more performance with a new '386 or '486 processor module.

And that's only the start of your many ZEOS system advantages. But what more could there be than dazzling performance, incredible prices and upgradability? From ZEOS there's lots more.

Because your new ZEOS system is not only fast, it's absolutely *loaded with features*. Like our 300 watt power supply, eight expansion slots, twin cooling fans (for even more reliability) and our unique seven bay SpaceSaver case. And, *every ZEOS system is UL® listed.*



Z-SPEED METER

Let the "Z-Meter" help you pick the processing power that's right for you. The comparisons are easy to make. Fast, Faster or Fastest!

r Power, & Price!

Your Exact Specifications.

PACKAGES 2, 3 AND 4 INCLUDE LOTUS BUNDLE!

	Pkg. #1	Pkg. #2	Pkg. #3	Pkg. #4
386-25	\$1395	\$1995	\$2495	\$2995
386-33	\$1495	\$2095	\$2595	\$3095
486SX-20	\$1595	\$2195	\$2695	\$3195
486-33	\$1795	\$2395	\$2895	\$3395

Add \$200 to any price for a 128K cache.

In addition to all of these standard ZEOS advantages, you're also receiving our legendary ZEOS Technical Support, *24 Hours a Day, 365 Days a Year*. Plus, our 30 day Absolute Satisfaction Money Back Guarantee and more!

So pick your Power, and your Price *then give us a call!* Your expert ZEOS Systems Consultant is ready to answer any questions you may have. Why not give us a call right now, Toll Free at 800-423-5891.

INCREDIBLE ZEOS PACKAGE #3

Add even more memory, a larger drive. And more Savings! You now receive:

- 4 full Megabytes of Ultra High Speed 53ns DRAM.
- Our fast 130MB IDE hard drive with built in cache.
- Both Teac® floppies, the 1.2MB and 1.44!
- Your Diamond VGA Plus card with 1MB DRAM.
- ZEOS 14" 1024x768 VGA Color Monitor w/Tilt & Swivel.
- Lotus 1-2-3 for Windows, Ami Pro 2.0, Microsoft Windows, DOS 5.0 plus a Microsoft mouse!

PACKAGE #3

THE ULTIMATE ZEOS PACKAGE #4

Now, Memory goes to 8MB and the drive to 210MB. The ultimate Power User's Dream Machine!

- 8 full Megabytes of High Speed 53ns DRAM.
- Your screaming 210MB IDE hard drive with its own built-in cache.
- Both Teac® floppies, the 1.2MB and 1.44!
- The Diamond VGA Plus card with 1MB DRAM.
- ZEOS 14" 1024x768 VGA Color Monitor w/Tilt & Swivel.
- Lotus 1-2-3 for Windows, Ami Pro 2.0, Microsoft Windows, DOS 5.0 plus a Microsoft mouse!

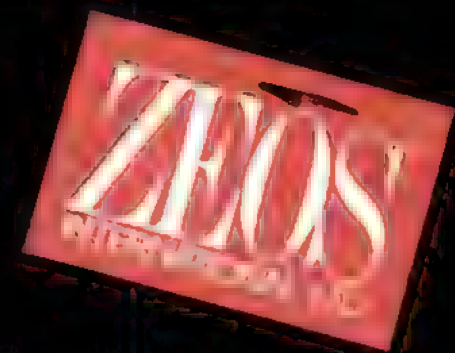
PACKAGE #4

**ORDER NOW, TOLL FREE
800-423-5891**

FAX Orders: 612-633-1325
Hearing Impaired (TDD):
800-228-5389

Govt. & Educ.: 800-245-2449
Outside US and Canada
Call: 612-633-6131

MasterCard, VISA, Discover,
Am Exp, Z-CARD, COD and
Leasing Programs.
Open 24 Hours a Day,
365 Days a Year!



Call to confirm current pricing, product specifications and configurations, all are subject to change without notice. Purchase orders subject to approval. Lotus, 1-2-3, Ami Pro, Classic and SmartIcons are trademarks of Lotus Development Corporation; Windows and Microsoft of Microsoft Corporation; Z-Card, SpaceSaver, and ZEOS of ZEOS International, Ltd., 530 5th Avenue NW, St. Paul, MN 55112 USA © 1991.

Why ZEOS is

☒ Now, your ZEOS modular system allows you to upgrade from one CPU to another as your computing requirements change. Obsolescence is virtually obsolete!

☒ You may choose between a variety of '386 and '486 processor options, both cached and non-cached.

☒ Made in USA! Your new ZEOS system boards are designed and manufactured by ZEOS, right here in the USA.

☒ ZEOS has utilized the very latest in highly integrated surface mount technology. Faster, cooler, more reliable systems for you!

☒ Every ZEOS modular system comes standard with incredibly fast *53 nanosecond DRAM*.

☒ Plus, you may expand your system with up to 32 megabytes of memory right on the motherboard.

☒ Your new system features the *exclusive* ZEOS seven bay desktop case, smaller than most five bay cases yet plenty of room for future expansion.

☒ Two whisper quiet cooling fans move more cool air thru your system increasing reliability and component life.

CHECK YOUR EXCLUSIVE

If you're deciding which new computer to buy, there are many important considerations.

Here, we've gathered together a number of these considerations for your review. Some are of obvious importance,

**ZEOS.
Eight Times
Editor's Choice.**

☒ Your *entire* system is UL* listed (not just the power supply). Few others offer this security; we wonder why.

☒ Eight slots, one for the video, seven more open providing plenty of room as your system requirements grow.

☒ Two high speed serial ports, one parallel port and one game port.

☒ Our top quality 300 watt power supply provides you with plenty of power for your present *and* future needs.

☒ ZEOS uses *only* genuine Teac* floppy drives. Accept nothing less.

☒ Monochrome TTL systems feature Genuine Hercules* brand graphics controllers. Only the best for you.

Your #1 Choice!

ZEOS ADVANTAGES:

while others are subtle yet critical to your ultimate satisfaction. We'll go over them here with you one by one.

Please feel free to use these as a basis for comparison with other system vendors. We believe you will come away with the conclusion that ZEOS is indeed Your #1 Choice.

 VGA color systems feature the high-res ZEOS 1024x768 monitor with the incomparable SpeedStar Plus card complete with One Full Megabyte of memory!

 Special package savings are available incorporating our most popular upgrades. Many packages include Microsoft® DOS plus Windows and a Mouse!

 For a limited time every ZEOS Windows system also comes with Lotus 1-2-3 for Windows plus Lotus' incredible new Windows word processor *Ami Pro 2.0*!

 *PC Magazine* said ZEOS offers "more options than even the most configuration hungry hound could possibly need." Let us build whatever you require.

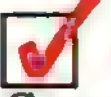
 Everybody loves ZEOS' 24 Hour a Day Toll Free Technical Support. You can call for advice any time of the day or night, 365 days a year!

 ZEOS systems have been selected by *PC Magazine* as *Editor's Choice, Eight Times!* These, along with many other consumer and industry awards attest to ZEOS' consistent and outstanding value.

 Your new system is backed by our 30 Day Absolute Satisfaction Money Back Guarantee, One Full Year Limited Warranty and our Express Replacement Policy.

 Buy with confidence. ZEOS is a strong and rapidly growing public company (NASDAQ Symbol: ZEOS). We've been around since 1981. We'll be around for a long time to come as well.

 ZEOS offers you a wide variety of payment options including MasterCard, VISA, Discover, American Express plus our own Z-Card, the ZEOS credit card featuring low consumer rates. Credit terms are also available along with very attractive leasing programs to qualified corporate customers.

 Friendly, knowledgeable ZEOS Systems Consultants are available 24 Hours a Day by calling 800-423-5891. You can call any time. When you add it all up, there's nothing like buying from ZEOS. There is certainly nothing like these new ZEOS systems!

**CALL NOW TOLL FREE:
800-423-5891**

Computers Now! SM

Take Your Pick. We'll Ship Today!

RIGHT NOW. GUARANTEED!*

Yes, we can ship your new ZEOS '386 or '486 today! We've built up an extra supply of the hottest selling computers in America in their most popular configurations.

Here's how it works. We have these incredible ZEOS '386 and '486 color VGA systems pre-built and ready to ship. While supplies last, we will ship any of these systems to you *the day you order* subject to these conditions:

1. Your order must be received by 1PM Central Time M-F.
2. Credit Cards are subject to authorization.
3. Orders must be for ZEOS '386 or '486 systems configured as shown here. Any other systems or upgrades are custom built and will take slightly longer.



**Yes! We can ship
your new ZEOS system
Right Now!
Place your order
by 1:00 PM Central
Time and we'll ship
today. Guaranteed!***

***OUR GUARANTEE TO YOU:**

If we accept your order for immediate shipment and fail to ship your system under the conditions outlined, we will ship it at *our expense* as soon as it is ready.

This offer is good only as long as these pre-built systems remain in stock; please give us a call to verify availability. This offer does not apply to other ZEOS systems or custom configurations.

IMMEDIATE SHIPMENT IS ONLY PART OF THE STORY.

These are not just any computer systems. They're the high performance, high quality ZEOS *upgradable* systems. Packing all the ZEOS value that has won PC Magazine Editor's Choice—*eight times!*

So why not give us a call right now. If we hear from you by 1:00 this afternoon, we'll get your new system on the way to you today! Call now Toll Free 800-423-5891.

Purchase orders from Fortune 1000 companies, Governments and institutions subject to approval. Leasing programs available. All prices and specifications subject to change without notice. Please call to confirm pricing, specification and warranty details. The following are trademarks of their respective corporations. Microsoft, MS-DOS and Windows of Microsoft Corporation, ZEOS, Computers Now!, SpaceSaver, SuperCase and Z-Card of ZEOS International Ltd. © ZEOS International Ltd., 530 5th Avenue, N.W., St. Paul, MN 55112 USA. ZEOS is a publicly traded company, NASDAQ symbol ZEOS. Lotus is a registered trademark of Lotus Development Corporation. Ami Pro is a trademark of Samna Corporation, a wholly-owned subsidiary of Lotus Development Corporation.

Our most popular '386 & '486 packages! 128K Cache, 130MB Drive, 4MB Memory and More. Ready to ship today!

'386-33 ONLY \$2795.

As a '486-33 ONLY \$3095!

- Upgradable CPU module allows you to change processors as your computing needs change!
- Ultra high speed Zero-Wait 128K SRAM Cache.
- 4MB of Zero-Wait 53ns DRAM, expandable to a Total of 32MB on the motherboard.
- Ultra Fast 130MB IDE Hard Drive.
- 1.2MB and 1.44MB Teac® floppies.
- ZEOS 14" High Res 1024x768 VGA Color Monitor with Tilt/Swivel base.
- High Speed 16-bit Diamond SpeedStar Plus VGA 1024 color graphics card with 1MB RAM!
- Lotus 1-2-3 for Windows, *plus* Ami Pro 2.0, *plus* Microsoft Windows and DOS 5.0, *plus* a genuine Microsoft mouse!
- Shadow RAM and EMS support for enhanced performance.
- ZEOS/RS 101 key SpaceSaver keyboard.
- High Speed ZEOS I/O with two Serial, one Parallel & one Game Port built in.
- 7-16, 1-8 bit expansion slots. Math coprocessor support for '386.
- Rugged ZEOS SpaceSaver Case with two cooling fans for added reliability and product life.
- Seven drive bays and our custom 300 Watt power supply for your future expansion.
- Includes ZEOS 24 Hour a Day Toll Free Technical Support and Customer Satisfaction package.

**ORDER NOW TOLL FREE
800-423-5891**

FAX Orders:
612-633-1325
Minnesota:
612-633-4591
TDD Orders:
800-228-5389

Outside US and
Canada: 612-633-6131
MasterCard, VISA,
Am Exp, Discover, Z-Card and COD.
Open 24 Hours a Day, 365 Days a Year!



Artisoft's Central Station: Innovative Connectivity for Your PC

HANDS ON
by Steve Rigney

Artisoft calls the Central Station a "connectivity processor," and rightly so. It's a chameleon-like device that can be configured in myriad ways, all designed to make your PC more versatile.

In its purest sense, the \$595 device is a docking station that connects to the parallel port of any PC, giving the machine a complement of one parallel and two serial ports along with a third serial port used for configuration management and future features. The box itself contains a power supply, NEC V40 processor, and EEPROM for storing directions and commands.

Central Station can also act as an external LAN adapter, functioning much like Xircom's external adapter, to provide any attached PC with a high-quality Ethernet connection. The Central Station has its own internal adapter—Artisoft's AE-3 circuitry—that emulates a Novell NE-2000 and includes both thin

coax and 10BaseT RJ45 connectors.

With the addition of a modem, the Central Station becomes an access server like the Shiva NetModem/E (see First Looks, Nov. 12, 1991). In this mode, people load modified LANtastic networking software on their laptops, run applications and environments locally, dial into the Central Station, and have full access to all networked drives.

The list of Central Station's possibilities goes on and on. A slightly different configuration allows a caller to remotely control the Central Station and also to run applications on its NEC V40 processor. Through the use of the optional *ArtiCom* software, networked users can dial out through a modem attached to Central Station, enabling it to act as an asynchronous communications server.

And the Central Station can also act as a print server, much like the Intel NetPort. You can attach a printer to the Central Station and allow any other PC

to send it print jobs across the LAN. Better still, when it is acting in remote-control and print server roles, it doesn't need a PC attached.

The Central Station isn't limited to LANtastic networks. You can add software that lets it work on *NetWare* installations, too.

Not all of Central Station's features are ready now. Currently, the basic unit can act as a docking station and as an external LAN adapter. The \$99 *NetWare* print server and the \$99 dial-in LANtastic netmodem are the first members of a new family of products called *Artisoft's Station Ware*, scheduled to ship by the time you read this review. We worked with preview versions of these *Station Ware* products.

Nor can the Central Station work all of its magic at once. Specifically, it can only have one user ID the network at a time. This means that you can use it as a docking station, an external LAN adapter, and a network print server simultaneously, but you can't use it as an external LAN adapter and as an access server simultaneously because each of those roles requires separate login names.

The unit requires approximately 32K RAM on the host PC to run the drivers necessary to connect as a node on the LAN under either LANtastic or *NetWare*. By taking advantage of its 32K of electrically erasable programmable ROM (EEPROM), you can read specific pieces of software into the Central Station from your PC's floppy disk drive or hard disk, set it up for operation, and let it work with or without a connected PC.

We tested the external adapter function under *NetWare*, as well as under LANtastic, and found no problems with the installation or operation. Like other external LAN adapters, Central Station attaches to the PC's parallel port, so the client



Central Station

Artisoft Inc., 575 East River Rd., Tucson, AZ 85704; 602-293-6363

List Price: \$595. Includes 128K RAM, 32K EEPROM, power supply, and 5-foot-long connecting cable. *Station Ware* applications, \$99 each

Requires: An Ethernet network, *NetWare* 2.x or 3.x, or LANtastic LAN operating system. Client PC must run DOS 3.1 or later. Works with any PC equipped with a parallel port.

In Short: Artisoft is definitely on to something big. Central Station is a special-purpose processor-in-a-box that can act as a docking station, an external LAN adapter, a network print server, and an access server. Artisoft is currently in the process of developing more applications for network tasks.

CIRCLE 480 ON READER SERVICE CARD

The Central Station can be configured to perform a number of network tasks.

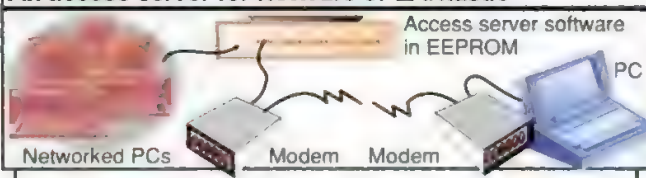
A docking station and external LAN adapter



A print server for NetWare or LANtastic



An access server for NetWare or LANtastic



PC's LAN throughput is limited to well under 1 megabit per second, depending on the speed of the CPU in the client PC. However, connecting Central Station doesn't steal away the capability to print as it does with external adapters, since the unit has its own parallel port for a printer connection. When you try to print and use the network at the same time, print jobs halt for the network traffic.

The LANtastic dial-in *Station Ware* was still in the early stages of development. Notably, it needed a library of modem setup strings and an easier way to configure the serial port.

Artisoft is currently in the process of developing many types of applications for Central Station. In concept, the external CPU could run all of your TSRs, leaving the maximum amount of free RAM in your PC. It also brings the notion of parallel processing to simple computers. Central Station will work with any computer, even a ten-year-old IBM PC, and carry the burden of network and other I/O tasks.

As with their network voice products, Artisoft has again demonstrated that it can deliver innovative products that work in several network environments.

First Looks

Infralink Eliminates Cables In PC-to-Printer Connections

HANDS ON
by Jonathan Matzkin

All the PC-to-printer wiring in some offices can look like an explosion in a pasta factory. But there is relief in sight. Infrared technology slings bits through space without the need for cables, promising to cut down on the electronic spaghetti that sprouts from modern desktops.

Infralink, from Infralink Datenteknik GmbH, uses infrared light to connect PCs and printers. The PC connects, via a standard Centronics printer cable, to a sleek, wedge-shaped infrared transceiver. An identical Infralink unit connects to the printer via a Centronics-to-Centronics cable and receives the file transmitted by the PC.

There is no software to install. Setup takes just minutes, and the system works transparently with whatever software you normally use for printing.

Each transceiver supports eight infrared channels. The transceiver connected to each shared printer can be set to a specific channel by pressing either of the two buttons on the Infralink's simple control panel. PC users, in turn, select a print-

er by tuning to that printer's channel on their personal transceiver. If the color ink jet is set to channel six, for instance, you would select channel six on your personal transceiver and then print as usual. In a typical office setting, transceivers can successfully communicate over distances of up to approximately 20 feet.

Unless the printer is located a relatively long distance from the PC, the Infralink seems like technological overkill. Given the \$499 list price (cables not included) for each Infralink unit, it's hard to imagine why a single user would choose it over a simple, reliable cable. (A three-unit kit, with cables, costs \$1,499.)

Its elimination of the PC-to-printer connection is offset by the fact that it uses more cables than a direct connection. Each unit must be attached to its host PC or printer, so the connection actually takes two cables. And each Infralink must be plugged into an AC outlet—problematic for users who already have precious little room left on their power strips.



The system has real potential, though, in peripheral sharing, since an unlimited number of PCs can be linked to the shared printers. The Infralink referees access to shared printers on a first come, first served basis. If you want to print to a device that's in use, a dot appears in the display of the PC's Infralink unit. When the job in progress is finished, the "in-use" dot disappears and the printer is once again available.

Unfortunately, the Infralink system is sensitive to certain conditions. It can't be covered or placed on a shelf, because that blocks the line of sight to the ceiling and prevents the unit from transmitting its infrared light. It must be placed a minimum of 5 feet below the ceiling. The system did not work in PC Labs, probably because the room's ceiling is obscured by

air-conditioning ducts and low-slung fluorescent light fixtures.

In *PC Magazine's* editorial office, which much more closely resembles a typical work environment, the units communicated successfully. But even there, distance limitations were an issue. A PC placed about 23 feet from the shared printer couldn't be linked, and the quality of the connection to another PC was greatly affected by moving the transceiver from one side of the desk to another.

It's quite possible that one day infrared links will completely replace printer cables. In the meantime, the Infralink system presents an intriguing solution for users who have a compelling need to link many PCs to shared printers, can swing the system's high price, and can provide an environment in which the system will work. ■

QBlazer Brings Speed, Small Footprint to Portable Modems



FACT FILE

Infralink

Infralink Datenteknik GmbH,
6525 The Corners Pkwy, #400,
Norcross, GA 30092; 404-409-
7858.

List Price: \$499 per unit;
\$1,499 for three units with
cables.

Requires: Parallel port,
standard printer cable for
connection to PC, double-
ended Centronics cable for
connection to printer.

In Short: Infrared light replaces
PC-to-printer cables in this
pricy though technically
commendable unit. Eight
channels let you establish
connections between an
unlimited number of PCs

CIRCLE 706 ON READER SERVICE CARD



The QBlazer, \$745 from Telebit Corp., is a high-speed modem that combines small size, many features, and few compromises. Until now, high-speed modem communications demanded too much from the limited resources of portable computers. Some notebook vendors force you to choose between an internal modem and a second battery pack. Choose an internal modem and precious power is zapped from your system, unless you remember to turn the modem off when it is not in use. Only a few pioneer notebook vendors even

offer internal modems faster than 2,400 bps. *

Enter the QBlazer. Built around AT&T's low-power digital signal processor (DSP), it manages to squeeze a gallon of power into a pint-size package (see sidebar). In fact, the QBlazer is less than 2.5 inches on every side, and from its CMOS circuitry to LED indicators that pulse rather than glow, everything about it is built to conserve power.

Inside this 8-ounce black box lives a full-featured 9,600-bps modem that responds to the typical AT command set. Telebit is guilty of a bit of hyperbole in marketing it as a 38,400-bps

modem, which presumes a perfect transmission line rarely available in the real world. But the point behind the hype is valid. The QBlazer supports V.32 speeds of 9,600 bps, V.42 error correction, and V.42bis data compression on the fly. It's also compatible with MNP 5 data compression.

The QBlazer comes with an AC transformer, but is just as happy running off of a standard alkaline 9-volt battery. Telebit claims that you can get up to 2 hours continuous use from one battery.

Given its small size and miserly power design, the modem is surprisingly generous in the features arena. There are eight separate LED indicators on the QBlazer's front panel that give

CONTINUES ON PAGE 52

SORRY, QEMM!



THERE CAN ONLY BE ONE WINNER.

And when it comes to memory management, PC Magazine picked NETROOM over QEMM and all the rest.

Why? Because NETROOM gives you up to 576K more memory by relocating LANs, device drivers, and TSRs, not only into High-DOS *between* 640K and 1Mb, but also into expanded or extended memory *above* 1Mb.

And, NETROOM is the only memory manager that runs on all PCs - 8088 through 80486. Not just with LANs, but even on stand-alone PCs!

That's why PC Magazine said "...it's a real winner...considering NETROOM's price and capabilities, you will find that there is no second choice."

Features:	NET-ROOM	QEMM	386 MAX
Windows 3.0 support	✓	✓	✓
Special DOS 5 support	✓		
Converts Ext. to Exp.*	✓	✓	✓
Relocates to High-DOS	✓	✓	✓
Relocates to LIM 3.2 Frame	✓		
Relocates to Expanded	✓		
Relocates to Extended	✓		
Works on 386/486	✓	✓	✓
Works on 8088/286	✓		
Memory Analysis Utility	✓		

*Requires NEAT ChipSet on 286 systems.

WHY NOT JUST STAY WITH QEMM?

You'd think we'd leave good enough alone. But we made NETROOM even better. With special DOS 5 support like 286 expanded memory support, installation support through on-screen hot-key help, and more.

Plus, with NETROOM you get the essential memory analysis utility DISCOVER, a diagnostic tool that unveils the hidden potential of your PC!

SPECIAL LIMITED TIME OFFER!

QEMM users, don't despair. Just send us the title page from QEMM, or any memory manager manual, and you'll save 50% off the regular price of NETROOM.

CIRCLE 313 ON READER SERVICE CARD

But sorry, this is a limited time offer, and we're probably going to change it soon!

Call toll-free 1-800-451-0551, fax (718) 392-4212, or mail coupon to: HELIX SOFTWARE CO. - SPECIAL OFFER, 47-09 30th St., L.I.C., N.Y. 11101 (718) 392-3100

YES! Please send me NETROOM for: M

☐ 1 user *\$99 + \$5 s&h ☐ 4 user *\$179 + \$5 s&h

YES! I'd like to save 50% and trade up to NETROOM (1 user) I've enclosed the title page of any memory manager and *\$49.50 + \$5 s&h.

☐ Check ☐ MC ☐ Visa Exp. _____

Acct. # _____

Name _____

Address _____

City _____ State _____ Zip _____

Phone () _____

NYS res. add 8 1/2% sales tax. Allow 2-4 weeks for delivery

**HELIX SOFTWARE
COMPANY**

*To support all of NETROOM's features on 8088/286 PCs you will need NEAT ChipSet or expanded memory hardware.

©1991 Helix Software Co., Inc. NETROOM, DISCOVER, QEMM, and 386MAX are registered trademarks of their respective corporations. Used with permission ©1991 Ziff Davis Communications, Inc. Editors' Choice awarded Jan. 29, 1991.

First Looks

QBlazer

CONTINUED FROM PAGE 50

plenty of status information during a communication session. And unlike many pocket modems, the QBlazer has a built-in speaker for monitoring dialing and connections.

The modem connects to your computer via a small DIN connector; it comes with pigtail cables and adapters to hook up with 9-pin and 25-pin PC-type serial ports or a Macintosh. All of the parts plus a condensed reference manual fit into a soft-sided pouch, which even has a sturdy Velcro wrap that attaches to the strap of your notebook's carrying case. The QBlazer also comes with a copy of MagicSoft's MTEZ communications software.

There are relatively few nits to pick in QBlazer's design. A volume control for the speaker would be convenient, and the sliding power switch is hard to move—you have to check carefully whether it's on or off. On the other hand, the unit is so small and attractive that it will also appeal to people with desktop computers who want to have an external modem but can't af-

ford to give up their precious workspace to a standard full-size model.

As with most miniaturized designs, you pay a premium. Comparable desktop designs list for as much as \$250 less. But if you're looking for a battery-powered portable modem that can keep pace with today's high-end notebook computers, the QBlazer may well be your best choice. ■

List Price: QBlazer, \$745.
Telebit Corp., 1315 Chesapeake Terr., Sunnyvale, CA 94089;
800-835-3248, 408-734-4333.

CIRCLE 702 ON READER SERVICE CARD



The QBlazer weighs 8 ounces, supports 9,600 bps, and can run off of a 9-volt battery.

AT&T'S DIGITAL SIGNAL PROCESSOR CHIP SET

As modem speeds reach beyond 2,400 bps, modem chips must perform exotic data compression techniques to squeeze data onto a limited bandwidth. This requires high-speed processing and consumes more power than many internal and portable modems can muster. As a result, there are few notebook computers equipped with internal modems that are faster than 2,400 bps.

AT&T's DSP chip solves

the problem by using RISC-like techniques to analyze the algorithms used in converting signals. At the heart of the QBlazer is a blindingly fast 16-bit chip with a small instruction set that specializes in signal processing and works faster than a general-purpose chip. Software algorithms that aid in modulation/demodulation are integrated onto the chip, eliminating the need to drive the more commonly used,

power hungry I/O pins on external memory chips. The DSP's power conservation features include a sleep mode of just 50 milliwatts, compared with 450mW for normal usage. AT&T also uses submicron process technology to pack more on a small device. The software integration, low power consumption, and miniaturization of this chip translate into the QBlazer's striking profile.—Carol Levin

NEC's UltraLite III Reverts Back To Classic Design



In 1988, NEC introduced a groundbreaking 4.4-pound diskless notebook with a V30 processor (8086-equivalent) running at 9.83 MHz—the NEC UltraLite.

From there it was all downhill. NEC's successive attempts to improve on the original ultimately resulted in a 7.5-pound 386SX, whose inflated dimensions stretched the term *notebook* almost as much as it stretched users' briefcases.

The UltraLite III, NEC's new 386SX/20, returns to its roots. This \$3,699, 4.8-pound machine has slimmed down and

powered up.

The 3.5-inch internal floppy disk drive is gone, reincarnated as a 1.2-pound external unit that connects to the notebook's side and is included with the system.

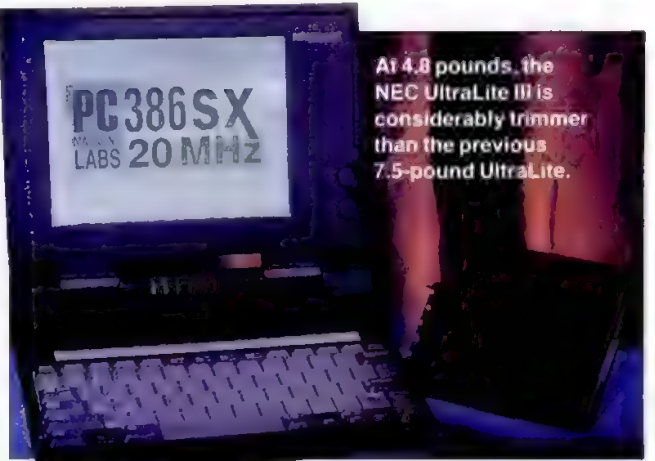
Designed thin to fit easily in your briefcase, the UltraLite III's case now measures 1.5 by 11.5 by 9 inches (HWD). The floppy disk drive and power supply are equally thin.

The standard configuration includes the external floppy disk drive, a 60MB hard disk, and 2MB of RAM, expandable to 10MB. The 9.4-inch diagonal, 640-by-480 resolution VGA screen displays 16 shades of gray (32 shades at 320-by-200 resolution.) An optional

docking station adds a full 5.25-inch half-height drive bay and one full-height or two half-height ISA slots. No scorcher, the UltraLite III performed in the midrange of today's notebook offerings on *PC Magazine's* benchmark tests. ■

List Price: NEC UltraLite III, \$3,699; docking station, \$999; NEC Technologies Inc., 1414 Massachusetts Ave., Boxbrough, MA 01719; 508-264-8000.

CIRCLE 434 ON READER SERVICE CARD



PHOTOGRAPHY: THOM O'CONNOR

**What happens
when you
consistently deliver
products with
superior
technology?**



Customer S

J.D. POWER AND ASSOCIATES®

Application Software Customer Satisfaction

1. Borland
2. WordPerfect
3. Claris
4. Aldus
5. Microsoft
6. Lotus

atisfaction!

Build better software and customers will beat a path to your door. That, in a nutshell, has been the history of Borland software. Borland's superior technology means highest customer satisfaction. In separate surveys, J.D. Power and Associates® ranked Borland "Best Application Software in Customer Satisfaction" in both Large Businesses¹ and Small to Medium-sized Businesses.*

Borland puts you in front of technology

Borland's leadership in object-oriented technology benefits you directly. Products like Quattro® Pro, Paradox®, ObjectVision™, Turbo Pascal® and Borland® C++ shatter the belief that powerful software can't be easy to use. Borland products work seamlessly together, giving you faster access to more types of data and easier, more comprehensive ways to manipulate and present it. The results? A reduced learning curve, more informed decision making, faster and better work completion . . . customer satisfaction!

And now with the addition of dBASE® and InterBase™ to Borland's product family, we deliver a complete, scalable database management architecture tailored to your company's growing needs.

Borland: your software company for the '90s

Buying software today shouldn't be an act of blind faith. All the technical support in the world won't improve a poorly engineered product. That's why Borland products are designed to be the best from the start. A fact confirmed by Borland's long-standing record of winning major industry awards for technical excellence.

Maybe that's the reason Borland continues to be the #1 choice of users around the world. Whether you want a spreadsheet, database or programming language, Borland has the innovative technology and the committed team of professionals who are dedicated to being your software company. Quite simply, with Borland software you know you are working with the best. And that's what satisfaction is all about. For more information about Borland or any of our products . . .

Call 1-800-331-0877, Dept. 5050



B O R L A N D

Software Craftsmanship

CIRCLE 285 ON READER SERVICE CARD

Index*

First Looks

PowerMenu Plus Adds Multipurpose Utilities

HANDS ON
by Bruce Brown

PowerMenu Plus, Version 6.0, adds to an already impressive bag of menu-shell tricks with new features: file transfer, virus detection, and menu groups. While there's no giant leap forward in technology or in the user interface, *PowerMenu Plus* remains a likable multipurpose, text-mode-based menuing program. It's much faster than DOS 5.0's DOS Shell and includes other helpful utilities.

PowerMenu Plus offers a subset of the features you'll find in programs such as *PC Tools*, but without the bloat. The program comes on two floppy disks; it occupies about 700K of disk space; the manual is 150 pages—all reasonable sizes.

In addition to the menu shell, *PowerMenu Plus* offers a screensaver that blanks the screen, followed by a one-line reminder message. It also lets you maintain system usage logs

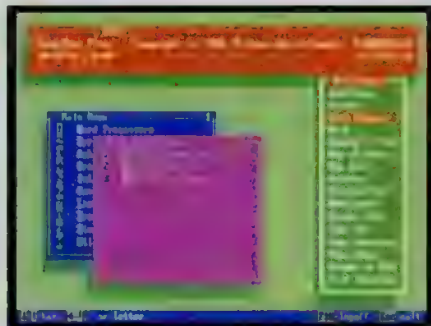
and assign multiuser and security passwords for menus, submenus, or applications. There's also a text editor that uses *WordStar*-like commands.

PowerMenu Plus 6.0's text-mode interface remains unchanged. It uses a hierarchical menu structure to start applications, run DOS commands or batch files, and call other menus. It works from a database of 270 applications, automatically building menus based on

the software already installed. No mouse support is available.

In addition to more traditional menu shells, menu groups offer a workgroup-oriented shell. For example, you can have the accounting and design departments access different application menus.

The program's PC Hookup lets you move files between computers via modem communication or via direct cable using a serial or parallel port. It doesn't include the convenient remote installation feature found in *LapLink* or *FastLynx*, but it has all the basics, including file tagging for multiple file transfer and an integrated file search and file-management submenu.



PowerMenu Plus 6.0 adds utilities that include virus detection and file transfer. It retains its original text-mode interface.

The virus-checking component, *Anti-Virus Plus*, from Iris Software, inspects drives for known file and disk viruses and can detect virus symptoms and known virus codes. With an extended service plan, you'll receive virus update files about four times a year.

New disk management features include directory pruning, grafting, and a hacksaw function that can erase a subdirectory. It supports PKZIP file compression with commands to zip and unzip tagged files as well as a zip viewer. The multiple-command DOS command line does just what it suggests: It lets you type more than one DOS command on one line.

If you can live with text-mode menus, there's much to like in *PowerMenu Plus*'s selection of menuing, security, virus detection, and file-management tools.

List Price: *PowerMenu Plus*, Version 6.0, \$89.95; \$29.95 for upgrade; \$750 for network version for 10 users. **Requires:** 384K RAM, DOS 3.0 or later, one floppy disk drive. Hard disk recommended. Brown Bag Software, 2155 S. Bascom Ave., #105, Campbell, CA 95008; 408-559-4545, 800-523-0764.

CIRCLE 432 ON READER SERVICE CARD

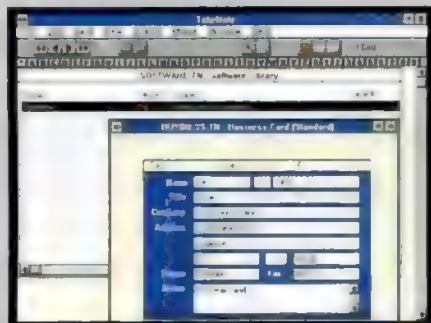
TakeNote: Simple, Super-CardFile for Windows

HANDS ON
by Eric Barn

If you live your life with *Microsoft Windows* on one side of your desk and your telephone on the other, consider putting ButtonWare's new *TakeNote* somewhere in between. At \$69.95, *TakeNote* travels past *Windows*' own Cardfile, arriving complete with 17 templates—for home and business use—that organize everything from your phone book to your recipe file to your videotape collection.

ButtonWare has designed an elegant yet easy-to-use product. The standard *Windows* menu bar borders the top of the screen, but the most common functions can also be accessed via a "ButtonBar." Each *Take-*

Note card can hold 8K of information. Data input goes quickly by using the Tab key to move among fields. You can import data from *dBASE*, *Windows* Cardfile, *WordPerfect* 5.1, or comma-delimited ASCII.



TakeNote's ButtonBar lets you access common "indexing" functions with a single key.

TakeNote has limited editing features, but data can be manipulated in many ways. You can view multiple decks of cards, or toggle to a "table" mode. You can: sort on any field in alphabetical or reverse alphabetical order; search using wildcards or a "sounds like" option; have your modem dial a phone number; and protect your informa-

tion using the encryption option. *TakeNote*'s print styles include Rolodex cards, labels, and tables. A "Print Test Line" button helps align labels on a dot matrix printer. It supports point sizes as small as 5 points, and bold and italic in all *Windows* typefaces.

TakeNote doesn't take full advantage of the *Windows* Clipboard. It's not very good at mail-merge, and it doesn't let you modify or create templates. ButtonWare says future versions will correct these shortcomings. While it is by no means a feature-packed personal information manager, *TakeNote* is a powerful Rolodex.

List Price: *TakeNote*, \$69.95, (\$49.95 before March 15, 1992). **Requires:** *Windows* 3.0. ButtonWare Inc., P.O. Box 96058, Bellevue, WA 98005; 206-454-0479, 800-528-8866.

CIRCLE 433 ON READER SERVICE CARD

Watch where you're going!

SureTrak 2.0 gives you more ways to manage your projects in progress.

Creating schedules is one thing—and SureTrak does it with ease.

But managing a project to a successful finish is what separates the pros from the wannabes.

That's where SureTrak leaves the others behind.

Use it to produce exceptional time-scaled logic diagrams, bar charts, resource profiles and cumulative curves. SureTrak does it all automatically—and lets you customize with symbols, logos or text.

SureTrak graphics and reports help you see how a project is going, pinpoint trouble spots, and develop alternatives to get you back on track.

You can even manage cash flow with SureTrak's exclusive ability to handle revenues, costs and profits.

It's a lot of project management software for just \$795. But then, what else would you expect from Primavera? Call 1-800-872-5457 today.



SURETRAK™
PROJECT SCHEDULER



PRIMAVERA
How the world says
project management

SureTrak Division
1574 West 1700 South
Salt Lake City, Utah 84104
(801) 973-9610

First Looks

Symbolagic's Adept Builds Expert Systems Graphically

HANDS ON
by Henry Fersko-Weiss

Symbolagic Corp.'s *Adept*, Version 2.0 (\$695) is an applications generator that combines visual, object-oriented programming under Windows 3.0 with expert system capabilities. This unusual combination lets application developers build extremely complex, "smart" programs with the ease of drawing a flowchart or decision tree.

Adept's ability to define procedures and to link these procedures to a knowledge base is most helpful in automating standard business procedures. Many common business activities—closing the accounting books for the year, controlling the environment in a clean manufacturing area, or installing a network—are really nothing more than well-established routines that can be broken down into tens, hundreds, or thousands of procedures. *Adept* records these procedures so they can be replayed by the end users who perform the tasks. The result is a procedural system that ensures consistency and also helps to avoid costly errors.

To create an application in *Adept*, you encapsulate a series of instructions for reaching a goal. These instructions are then linked together or nested. You can connect an unlimited number of steps in a procedure, and an unlimited number of pro-

cedures. This "network of procedures" is tied together according to anticipated responses from end users or by values that are automatically returned from other programs that communicate through the Windows DDE or DDL facilities.

Adept is the first expert system to use the procedural approach to expert systems, rather than the more traditional "if-then" rules model. This approach was developed at the Stanford Research Institute and NASA. Unlike the rule-based model, which requires the expertise of a "knowledge engineer," *Adept*'s procedural approach is accessible even by nonprogrammers. Nonetheless, the program is not intended for the casual end user.

You create an application by placing and linking graphical objects called nodes. Nodes can be cut, copied, pasted, and moved, individually or in combination. When you're done, you have a diagram that looks very much like a flowchart. End users working with a runtime version of the application see only the screen displays, which you create after the procedures are in place.

Representing steps in a procedure, *Adept* nodes come in four flavors—start, work, case, and end—and are accessed either from a Node palette or from a menu. The work node represents a true/false/unknown deci-

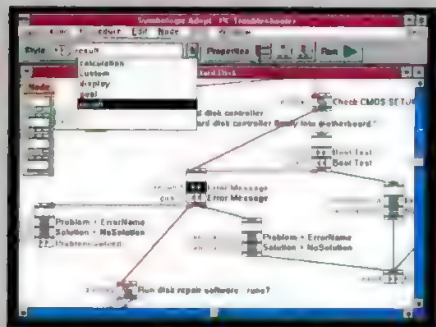
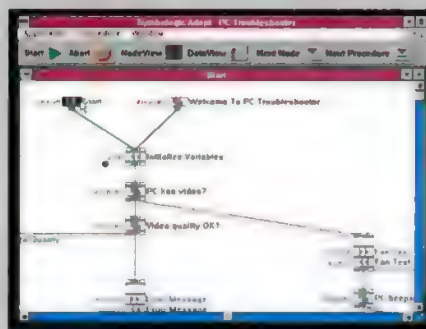
sion point, and the case node is a multiple-choice decision point.

Nodes also have selectable styles. For example, the calculation node performs a mathematical operation, calls a function, or compares variables. The display node brings up a screen to get information from an end user or suggest an activity. The goal node links to another procedure that can solve a problem and return an answer. The result node triggers another procedure, depending on the result of an operation. *Adept* also enables you to design your own node style using a built-in scripting language.

You then create a path through the procedure by connecting the nodes with arcs—lines that you drag from the nodes. *Adept* relies on a color-coding scheme to distinguish among the true (green), false (red), and unknown (blue) paths through a procedure. At the right of each node is an English-like statement that tells you the condition, goal, result, operation, or question posed by that node.

Once you create the procedures, you're ready to design the end-user displays using *Adept*'s Tools palette. An underlying grid and rulers help in precise placement of design elements. The default displays carry the statement you originally attached to a node. You can alter the default statement to make it more explanatory and change the font style. And you can add other display elements such as text fields, colors, bitmaps, shapes, several styles of buttons, and list boxes. The possibilities are nearly endless. For

After you design a flow-chart of procedures, *Adept* shows a node view of the application. You can do a test run and make sure the steps are complete and logical.



Adept nodes represent steps in a procedure and come in a variety of types and styles. The "result" style triggers another procedure.



FACT FILE

Adept, Version 2.0

Symbolagic Corp., 15379 N.E. 90th St., Redmond, WA 98052; 206-881-3938.

List Price: \$695; unlimited runtime version for each application, \$1,295.

Requires: DOS 3.2 or later, Microsoft Windows 3.0 or later.

In Short: By combining an expert system builder with an object-oriented application generator, Symbolagic's *Adept* lets you create programs embedded with complex procedural knowledge easily. It's ideal for producing applications centered on repair, diagnosis, maintenance, and help-desk functions.

CIRCLE 430 ON READER SERVICE CARD

Accounting/Finance
Business Graphics
CAD
Communications
Desktop
Desktop Publishing
File/Print Management
Graphics
Operating Systems
Programming

Managing Your Money	129
Moneycounts	34
Pacioli	34
Peachtree III	156
Quicken v5.0	39
Timeslip III	209
Microsoft Money	49
Checkfree	19
ABC Flowcharting	194
Aldus Persuasion for Windows	354
Calendar Creator Plus	40
Charisma v2.1	344
Draw Perfect	279
Easy Flow v7.0	164
Flowcharting III	139
Form Filler	74
Form Tool Gold	63
Freelance Graphics v4.0	309
Harvard Graphics v3.0	104
Hijack	69
Org Plus Advanced	309
Powerpoint for Windows	299
Perform Pro	299
Autosketch v3.0	159
Design Cad	159
Design Dad 3D	204
Dratix Ultra	249
Dratix for Windows	429
Generic CADD v5.0	299
Carbon Copy v5.0	124
Crosstalk Communicator	59
Crosstalk MK IV	139
Crosstalk for Windows	124
Dynacore for Windows	159
Fast Lync	79
Laplink III	94
PC Anywhere IV	99
Procomm Plus v2.0	69
Smartcom III	119
Smartcom Exec	79
Clarion Professional	499
Clipper v5.01	499
dBase IV v1.1	839
dBase IV v1.1 Developers	189
Foxbase+	299
Foxpro v2.0	479
PC File v4.0	84
Personal R:Base	99
Q&A v4.0	279
R:Base v3.1	469
R&R Report Writer	159
Superbase IV	429
Alpha Four	329
Paradox v3.5	499
Paradox Engine	99
Adobe Illustrator	319
Adobe Plus Pack	119
Adobe Streamline	129
Adobe Type Align	69
Adobe Type Manager	69
Adobe Type Set #1	69
Adobe Type Set #2	69
Adobe Type Set #3	139
Corel Draw 2.0	379
Designer	464
Facelift for Windows	64
Facelift for Wordperfect	64
First Publisher	144
Microsoft Publisher	409
Art & Letters Graphics Editor	669
OmniPage Professional	499
Pagemaker v4.0	124
PC Paintbrush IV	30
New Print Shop	309
ReadRight for Windows	269
Animator	499
Ventura Gold for Dos	499
Ventura Gold	499
Ventura Gold for Windows	499
Ventura Gold for OS/2	499
ACT	219
Agenda v2.0	299
IBM Current	234
Harvard Project Manager	449
Timeline v4.0	449
Packrat	265
Project for Windows	459
First Choice	94
Lotus Works	94
Symphony v2.2	499
Microsoft Works v2.0	94
Works for Windows	139
Office for Windows	519
Desqview v2.3	79
Desqview 386	139
DR Dos v6.0	139
Geoworks	129
MS Dos v5.0 Upgrade	59
PC Dos v5.0 Upgrade	49
PC DOS v5.0	129
OS/2 Standard	139
Windows v3.0	94
Unix/Xenix	Call
Brief	184
Smalltalk for Windows	279
Smalltalk V/PM	294
Tutorial for Windows	299
Barland C++	319
Objectvision	99
Turbo Pascal for Windows	164
Turbo Pascal v6.0	104
Basic v7.1	319
C Compiler v6.0	319
Microsoft Fortran	299
Micro Assembler	109
Quick Basic	74
Visual Basic	69
Visual Basic	139

The Callsoft Value:

• Best Prices • Same Day Delivery
• Knowledgeable Staff • No Visa, M/C Charge
• Free Ground Shipping • 30 Day Warranty
• Corporate P.O., A.P.O., F.P.O. and International Orders Welcome

CallSoft

Estd Since 1982

Your Best Value Period!

Software and Peripherals at
Best Prices and Full Service

ORDER NOW AT
1-800-777-5014
(Mon-Fri 8:00AM - 8:00PM EST)

We will promptly replace any defective item returned within 30 days, but cannot guarantee availability. There is a 15% handling fee on any non-refundable, non-returnable goods, and all returns must be accompanied by a letterhead request and copy change. For better or worse, without return. While ground shipping may be free, we do add \$15.00 per item for 3-day, \$22.00 per item for overnight, and \$4.00 for C.O.D. 7% surcharge on American Express.

Upgrade from any version of Lotus 1-2-3 gets 1-2-3 Windows plus AmiPro for only

\$139

AmiPro™ competitive upgrade (any word processor) for only

\$89

Windows Dev Toolkit	329
Lotus 1.2.3 v2.3	339
Lotus 1.2.3 v3.1.1+	399
Lotus 1.2.3 for Windows	399
Excel v3.0	319
Quattro	74
Quattro	339
Wingz PC	339
Always	119
Impress 2L	79
Sideways	59
386 Max v5.1	79
Above D sk	64
Auto Menu	39
Blue Max	94
Central Point Anti-Virus	84
Central Point Backup	84
Check It	89
Copy II PC	29
Direct Access	64
Disk Technician Gold	99
Fastback v3.0	114
First Apps	54
Netroom	54
Icon Designer	39
Mace 1990	99
Menu Works	25
Norton Utilities	114
Norton Anti-Virus	89
Norton Backup	99
Norton Commander	104
Norton Desktop for	99
Windows	79
PC Kwik Powerpack	100
PC Tools Deluxe v7.1	49
PC Zip	104
Print Cache	49
Q DOS III	64
QEMM 386 v6.0	54
QRAM	149
SPF PC	64
Spinrite	84
Virex PC	54
Windows Express	94
Xtree Gold	29
After Dark for Window	89
Laplink III	104
Magellan	289
Am Pro v2.0	99
Am Pro Upgrade	239
Displaywrite V	139
Double Up Upgrade	134
(AmiPro and 1.2.3 for Windows)	274
Letter Perfect	169
Multimate v4.0	59
Professional Write Plus	319
for Windows	259
Rightwriter	214
Word for Windows	54
Word for Word Pro	219
WordPerfect v5.1	339
Wordstar v6.0	169
Grammatik IV	34
Grammatik for Windows	24
Word v5.5	539
Adobe Postscript Cart	329
Adobe Type Cart #1	569
Adobe Type Cart #2	469
Advanced Gravis Joystick	419
Advanced Gravis	74
Elmator Joystick Card	74
canonatic AE 2 Ethernet	149
Shifter Kit	324
386 250 Tape	99
Backup Drive (Internal)	169
V-Series Smartmodem 9600b	269
v42bis	169
Above Board Plus w/2mb	399
Saturation Classic	399
Mouseman Serial Right Handed	269
Mouseman Bus Right Handed	169
Mouseman Serial	299
Right Handed w/ Windows	399
ScanMan 256	399
Microsoft Serial or Bus Mouse	269
Microsoft Mouse (Bus or Serial)	169
with Windows	299
Pacific Page Postscript for	224
HP Series II	
Pacific Page PCE Postscript for	
HP Series IIP III	
1.2.4 Plus 2mb Memory Board	
for HP Series IIP ID	
Pacific 4.2mb Memory Board for	
HP Series IIP II	
25 nOne Font Cart	
Practical Per PM9600SA	
w/ V42bis	

YOUR BEST VALUE!

Please call for any item not listed. We have an extensive inventory to cover all your needs, and our purchasing staff will assist in any item not inventoried. We are a Novell Authorized dealer, please call for any Novell or Networking Product. We are also an IBM authorized dealer, call for any IBM software needs.

CIRCLE 190 ON READER SERVICE CARD

Maynard®

An ARCHIVE® Company

The simple solution to
standardizing corporate data
backup.



With MaynStream® backup, managing your DOS and OS/2 data is child's play.

Go ahead. Back 'em up, mix 'em up. Because MaynStream lets you seamlessly manage your corporate PC environment, going from DOS to OS/2 and back again with the same easy-to-read menus and standard user interface. So now you can backup, restore, combine and exchange DOS and OS/2 data as easily as ABC. With the one family of backup systems that standardizes it all—MaynStream.

MaynStream is the smart backup solution for almost every operating environment. From standalone DOS or OS/2 workstations to Novell, 3COM, Token Ring or LAN Manager-based

networks and a host of others. MaynStream supports them all. And our award-winning software isn't just Novell certified on 286 and 386 servers. It's also the only software Novell certified to backup local workstation data.

MaynStream is an easy choice when it comes to value, too. Because we give you convenient, built-in features that others charge extra for or don't even offer. Like intelligent file cataloging for easy, fast file restoration, fully automatic scheduled backups that don't tie up your computer, automated unused file-to-tape archiving and support for unlimited capacity.

Innovative software engineering coupled with high-quality drives have made us the world leader in backup systems. In fact, corporate users consistently rate us tops in reliability. And our data backup systems are available in configurations to fit every requirement. Internal or external, cartridges, cassettes, 8mm and 4mm DAT, with capacities ranging from 40MB to a whopping 2.2GB, including our new 525MB system—it's all part of why we say we're backing you in every way.

So why kid around with halfway solutions. Make it simple for yourself. Call us:
1-800-821-8782

Maynard Electronics, Inc.
Marketing Communications
36 Skyline Drive
Lake Mary, Florida 32746
1-407-263-3500 (USA)
011-44-494-473-434 (UK)



Archive is a registered trademark of Archive Corporation. Maynard and MaynStream are registered trademarks of Maynard Electronics, Inc. All other product names herein may be trademarks or registered trademarks of their respective companies.

CIRCLE 495 ON READER SERVICE CARD

by
Nate Zelnick

New & Improved

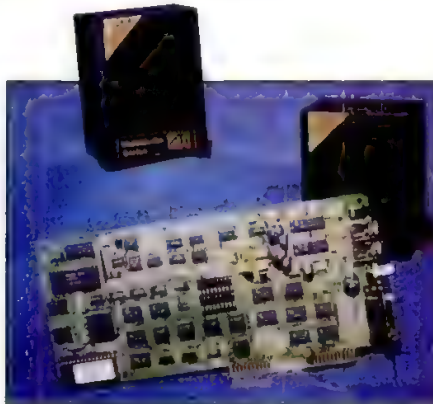
News of Announced Products and Upgrades

Ad Lib Boosts Stereo; ATI Mends Sound And Graphics

NEW Ad Lib has developed a Surround Sound Module for use with its line of Gold Stereo Sound Adapters. The \$89.95 piggy-back card snaps on to the Ad Lib Gold board, and provides a range of sound enhancements including stereo depth simulation, artificial reverb, and echo.

The Surround Sound Module is compatible with the entire library of applications written with Ad Lib sound support and requires no special speakers.

ATI Technologies now combines high-fidelity, stereo sound, and video graphics technology on a single board. VGASTEREO-F/X incorporates 8-bit stereo DACs and ADCs, sound filters, Dynamic Level Controls, and the VGAWONDER XL controller, which offers 15-bit color support and Super VGA graphics. VGASTEREO-F/X, available with either 512K or 1MB of video memory, is compatible with



ATI's VGASTEREO-F/X combines stereo sound and VGA graphics in a \$499 board.

the Microsoft Multimedia specification and is software driver-compatible with Ad Lib and Sound Blaster boards. The VGASTEREO-F/X displays 1,024-by-768, 800-by-600, and 640-by-480 resolutions with 256 colors in both interlaced and noninterlaced modes.

List Price: Surround Sound Module, \$89.95; VGASTEREO-F/X, \$449 (512K), \$499 (1MB).

Requires: Surround Sound Module, Ad Lib

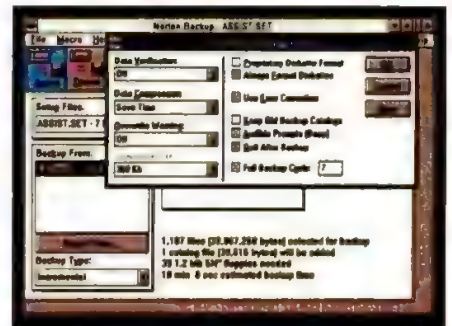
Gold Card; VGASTEREO-F/X, Ad Lib Inc., 220 Grande-Allee Est, #850, Quebec, Canada G1R 2J1; 800-463-2686; 418-529-9676. ATI Technologies Inc., 3761 Victoria Park Avenue., Scarborough, Ontario, Canada M1W 3S2; 416-756-0718.

CIRCLE 436 ON READER SERVICE CARD

Symantec Updates Norton Backup and Norton AntiVirus

IMPROVED Symantec is now offering updates to two of its programs, adding *Windows* operation to its *Norton AntiVirus* and a scheduler to the DOS version of *Norton Backup*.

Norton Backup also offers an interchange-



Symantec is shipping both DOS and *Windows* versions of *Norton Backup* in one package. The two now share an interchangeable file format.

able file format with its *Windows* version, so users can easily exchange backup files from all versions of the product. New file viewers let you examine your disk, several files at a time, prior to archiving. Other new features include a "backup assistant" feature that provides preconfigured archiving routines for scheduling daily or weekly backup, file-finding, enhanced support for Novell *NerWare* messaging during remote backup, and password protection for archived sets to protect your files against accidental overwriting.

Norton AntiVirus, Version 2.0, has eliminated its disk-consuming 77K hidden checksum files, freeing more disk space. A recursive scan and repair feature now detects and cleans stealth and encrypting viruses on your disk in one operation. Other improvements include a rescue disk for easier repair of boot

CONTINUES ON PAGE 62

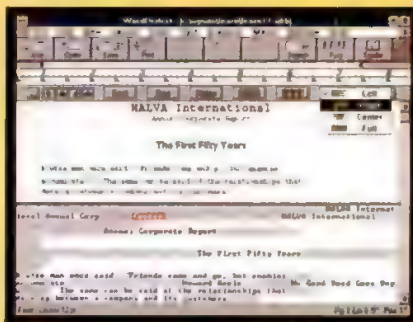
HOT PROSPECT

AFTER SOME STALLS, WORDPERFECT FOR WINDOWS LOOKS NEAR-PERFECT

At Fall Comdex 1990, WordPerfect Corp. demonstrated its *Windows* word processor, announcing that it would ship in early 1991. One year later, they are poised to deliver. *WordPerfect for Windows*, Version 1.0, a \$99 upgrade from any previous version of *WordPerfect*, offers an easy *Windows* migration path for *WordPerfect* devotees.

The optional "button bar" across the top of the screen displays icons that represent any macros or menu commands, but unlike other icon bars that use confusing symbols, this one offers labels. *WordPerfect for Windows* also offers relief from the limitations of *Windows*' printer drivers, allowing use of the DOS *WordPerfect* drivers. Upon installation, users can also choose between the DOS keyboard or the new *Windows* layout. The program's file manager includes a customizable button bar and a file viewer. In addition to standard file-management and file finding functions, applications can be added to its menu for quick launching. Files are fully compatible with *WordPerfect* for DOS.

List Price: *WordPerfect for Windows*, \$495; upgrade from previous versions of *WordPerfect*, \$99. **Requires:** 4MB RAM, *Windows* 3.0 or later. WordPerfect Corp., 1555 N. Technology Way, Orem, Utah 84057; 800-451-5151, 801-225-5000.



WordPerfect for Windows offers a view of formatting codes that *WordPerfect* users have come to expect.

CIRCLE 435 ON READER SERVICE CARD

New & Improved

BRIEFS



WINDOWS

Lotus Development Corp. has released Version 1.1

(\$495) of *cc:Mail Windows Platform Pack*, an upgrade of their LAN-based electronic mail package. It now supports *Microsoft Windows 3.0 Dynamic Data Exchange (DDE)* and includes Lotus SmartIcons for easy access to commonly used functions. 617-577-8500.

Atitash Software has released Version 2.0 of *WideAngle* (\$129.99, upgrade from 1.0, \$45), a software utility that enlarges the *Windows* desktop viewing area and accelerates the transition from DOS to *Microsoft Windows 3.0*. Version 2.0 now lets users switch between multiple DOS and *Windows* applications. *WideAngle 2.0's* hotkey system allows users to define custom keys. XRAY View places each window in a transparent workplace, letting users instantly perform such functions as locating, closing, or moving any existing window without having to shrink or traverse overlapping windows. 603-882-4809.

TIMESLIPS Corp. has newly released a *Windows* version of *TimeSheet Professional*, a time- and expense-tracking program available for individual (\$199.95) or network (\$699.95) use. The software gives users a spreadsheet time entry format that tracks time and expense for an unlimited number of employees, clients, projects, activities, and other variables. It also has a customized report writer that can instantly access any information logged into the program. The program's terminology can also be customized to suit individual or business needs. 800-285-0999, 508-768-6100.

The Complete PC has shipped Version 2.6 of *The Complete Communicator* (\$499), which lets users send computer generated faxes directly from *Microsoft Windows 3.0*. It now also supports *Microcom Networking Protocol (MNP) 5* data compression and V.42bis error correction for faster and more reliable data transmission. 408-434-0145.



DOS SOFTWARE

Gamma Productions has shipped Version 4.0 of *Multi-Lingual Scholar* (\$595), a PC-DOS-

CONTINUES ON PAGE 64

CONTINUED FROM PAGE 61

and partition table damage; a faster "executable-only" scan, which limits virus checks to .COM, .EXE, .SYS, and other vulnerable file types; and the ability to load or unload the TSR as needed.

List Price: *Norton Backup*, Version 2.0, \$129; upgrades, \$29. *Norton AntiVirus*, Version 2.0, \$129; upgrades, \$29. **Requires:** *Norton Backup* requires 512K RAM, DOS 3.1 or later; *Norton AntiVirus* requires 384K RAM, DOS 3.1 or later. Symantec Corp., 1021 Torre Ave., Cupertino, CA 95014-2132; 800-441-7234, 408-252-3570.

CIRCLE 437 ON READER SERVICE CARD

Borland Adds Object Library to Ease C++ Development

IMPROVED Borland has integrated several of its C and C++ products and added *ObjectWindows* and *TurboVision* to create a package the company is calling *Application Frameworks*. *ObjectWindows* is a collection of *Windows* objects, including full source code, for windows, menus, edit fields, and dialog boxes. *TurboVision* offers similar objects for creating DOS programs with CUA-interfaces.

The package also includes C++ 2.0, which has both an ANSI C and a C++ compiler; support for creating *Windows* DLLs and .EXE files; the *Whitewater Resource Toolkit*; Protected mode versions of the *Programmer's Platform* environment; *Turbo Debuggers*; *Turbo Profiler*; and the *DPMI* supporting *Turbo Assembler*.

List Price: Borland C++ with *Application Frameworks*, \$695; upgrades from C++, \$195; upgrades to *ObjectWindows* or *TurboVision*, \$99. **Requires:** DOS 3.0 or later. Borland International Inc., 1800 Green Hills Rd., P.O. Box 660001, Scotts Valley, CA 95067-0001; 408-438-8400.

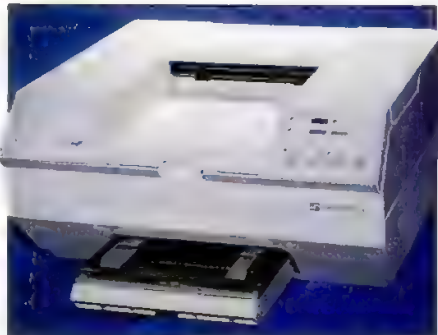
CIRCLE 438 ON READER SERVICE CARD

JOLT Puts True-Black Text in Color Thermal Printer for Under \$5,000

NEW Dataproducts is now shipping JOLT, a 300-by-300-dpi solid ink jet printer. Unlike other color printers that rely on thermal crayons, it prints true-black text as well as color. The solid, crayon-like ink "Jet Pack" cartridge is loaded into the printer. When heated, the ink becomes liquid and is jetted onto the paper, producing laser-quality black text and bright color, according to Dataproducts.

JOLT, equipped with both a *Centronics* parallel and RS-232C interface, is available in two configurations. The \$4,995 version (1MB of memory, additional upgrades in increments of 3MB and 5MB to a maximum of 6MB) supports *Windows 3.0*. The \$6,995 JOLT PS

(6MB of memory, with an available 4MB memory add-on), is equipped with *Adobe Systems' PostScript Level 2* page description language. JOLT PS has a SCSI port for font storage and parallel and serial interfaces. The 45-pound printer (19.5 by 21 by 10 inches) is rated by the company at 2 ppm for text, 0.7 ppm for graphics, and 1 ppm for an integrated document. Black cartridges, yielding over 2,000 printed pages at 2 percent ink density, and color cartridges, yielding over 400 printed pages at 10 percent ink density, are available for \$40 and \$60, respectively. The set of four (black, cyan, magenta, and yellow), costs \$179.95.



Dataproducts' JOLT uses a proprietary solid ink to give you true-black text in addition to solid ink color.

List Price: JOLT, \$4,995; JOLT PS, \$6,995. Black ink cartridge, \$40; color ink cartridge (cyan, magenta, yellow), \$60; set of all four, \$179.95. Dataproducts Corp., 6219 DeSoto Ave., Woodland Hills, CA 91367; 800-289-5658.

CIRCLE 436 ON READER SERVICE CARD

Way You Work Does it Your Way

NEW Proteo Technology announces *Way You Work*, a \$399 DOS-based productivity software package that insulates users from the complexities of the DOS command structure. *Way You Work* attaches 1,000 bytes of additional object details to each file, providing point-and-shoot menus as an alternative to DOS commands.

The package allows the use of filenames that exceed the 8-character DOS limit and loads the appropriate software program and file when a command requires its presence. Built around a "personal office" structure, *Way You Work's* menus include desktop, in- and out-baskets, calendar, briefcase, and wastebasket, and stores work objects in folders and drawers organized by subject matter. All information pertaining to one project can be stored in one folder, rather than in each software program's DOS directories.

According to the company, *Way You Work* includes "intelligent software robots" that can

CONTINUES ON PAGE 64

What a racket!



**3,000 bucks for a CAD program?
Are you kidding?**

DesignCAD 2D is only \$349, and it has more and better features than the other CAD programs that cost \$3,000!

And, if you're ready for a three dimensional CAD program, there is the state-of-the-art DesignCAD 3D ... for only \$499!

DesignCAD is the software used in the design of Andre Agassi's tennis rackets, the Patriot missile, and scores of other high tech, low tech, and no tech products.

So what's all the racket about? It's because we believe that it's silly to spend more on a CAD system than you would on a word processor. Agree? Well, the ball's in your court.

*Your product designed with DesignCAD?
Let us know, and maybe we'll put it in one
of our ads.*



American

Small Business Computers, Inc.
One American Way • Pryor, Oklahoma 74361
(918) 825-4844 • FAX (918) 825-6359

CIRCLE 47 ON READER SERVICE CARD

European Headquarters:
102 Rue La Fontaine • 75016 Paris, France
Phone 331 4520 6540 • FAX 331 4520 6539

Other offices in:
Brussels • Bucharest • Istanbul • London
Mexico City • Prague • Sao Paulo • Tokyo • Warsaw

Also Available for Macintosh

New & Improved

BRIEFS

CONTINUED FROM PAGE 62

based word processing package that lets users freely mix any combination of 60 languages within a single document. The program offers standard support for most Latin-, Cyrillic- and Arabic-based languages, as well as Hebrew and Greek. Version 4.0 also comes with *Font Scholar*, which allows users to modify existing fonts, add new characters, or create entirely new alphabets. The Keyboard Map tool makes it possible to rearrange keyboard layouts for any language. 213-394-8622.

Discoversoft is shipping Version 3.0 of *Treesaver* (\$89.95), a software utility for LaserJet printers that can print four or more pages on one sheet of paper. Version 3.0 adds over 20 new features, including one that allows double-sided printing on standard laser printers and job restart on any page. 510-769-2902.



HARDWARE

Hitachi America has released a new PC peripheral that integrates fax, scanner, printer, and copier capabilities in one unit, the CFX-1PC (\$2,195). The unit has a small (17-by-13-inch) footprint, and lets users fax documents directly from the PC, receive plain-paper faxes, scan, print files and faxes, and copy original documents in three resolution settings. Also included is a *Microsoft Windows 3.0*-based software program that gives users a graphical environment in which to manage all functions of the CFX-1PC. 404-446-8820.



COMMUNICATION SOFTWARE

Deirina has added Class 1 fax support to *WinFax PRO* (\$119). The addition allows the software to drive fax modems based on the Class 1 RC224ATF and Class 1/2 RC9624AC chip sets from Rockwell, such as the Motorola Fasttalk FAX32 and others. Other standards supported by the software include Class 2, CAS (Intel), and SendFax (Sierra). 800-268-6082, 416-441-3676.

Attachmate has updated *Extra! for Windows* (\$425; upgrades \$75), adding a DDE macro feature, APL character display, command line file transfer, and

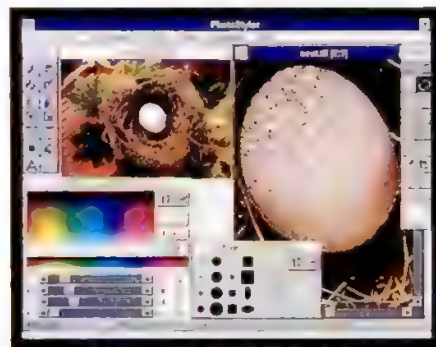
CONTINUES ON PAGE 66

be set to perform backups, pull forward postdated work objects, or empty the package's wastebasket. By implementing the "record what I do" macro feature, personalized robots can be created to perform specialized tasks. **List Price:** \$399. **Requires:** 640K RAM, 3MB disk space; DOS 3.1 or later. Proteo Technology Corp., 210 Carnegie Centre, #101, Princeton, NJ 08540-6233; 800-668-6716, 609-520-9880.

CIRCLE 440 ON READER SERVICE CARD

PhotoStyler 1.1 Enhances Windows Image-Processing

NEW Originally developed by U-Lead Systems Inc., *PhotoStyler* was acquired and enhanced by Aldus to be compatible with other Aldus products. *PhotoStyler 1.1* is a full-color image-processing program that lets *Windows 3.0* users scan, create, enhance, and retouch 24-bit color, gray scale, and black-and-white images. Images can be printed from *Windows* or exported in a number of file formats. According to the company, this \$795 program includes improved file-format compatibility with *PageMaker*, brush tools for image editing, and Aldus's command key routines for keyboard shortcuts. Registered owners of U-Lead's *PhotoStyler 1.0* receive free updates of Aldus *PhotoStyler 1.1*.



Aldus's version of *PhotoStyler* uses *PageMaker*'s command-key routines and file format and has new image-editing tools.

List Price: \$795. **Requires:** 2MB RAM, *Windows 3.0* or later, mouse or pointing device. Aldus Corp., 411 First Avenue South, Seattle, WA 98104-2871; 206-622-5500.

CIRCLE 441 ON READER SERVICE CARD

One-Write Plus Accounting Works: Integrated Solution

NEW Great American Software is now offering a solution for automating a small business. *One-Write Plus Accounting Works* integrates accounting and payroll functional-

ity, basic word processing, mail merge, and a spreadsheet link, backup utility, and menu organizer.

A single menu accesses *One-Write Plus Accounting* (General Ledger with Checks and Receipts, Accounts Receivable with Invoicing, and Accounts Payable), *One-Write Plus Payroll*, and *Get Paid Plus*, a collection and correspondence tool. The package also includes the spreadsheet link *@Accounting*, the *DataSave* backup utility, and *PC Menu*. **List Price:** \$299. **Requires:** 640K RAM, DOS 3.1 or later. Great American Software Inc., 615 Amherst St., Nashua, NH 03063; 800-388-8000, 603-889-5400.

CIRCLE 442 ON READER SERVICE CARD

Everex Adds Plain-Paper Fax to PS Printer

NEW Everex Systems has built a plain-paper fax machine into its LaserScript FAX Adobe PostScript laser printer. The FAX is a Group III send/receive device.

The LaserScript FAX is a 6-ppm, 300-dpi printer that has auto-switching between PostScript and PCL 4. Based on a 25-MHz National Semiconductor processor and a floating-point accelerator, the printer comes with 4MB of RAM and is expandable to 6MB.

The printer comes bundled with fax software for *Windows* that uses a *dBASE III-* and *IV*-compatible phone book database. The software supports screen form sending for quick screen dumping and automatic cover pages. **List Price:** Everex LaserScript FAX, \$3,295. **Requires:** Open parallel and serial port; modular phone jack. Everex Systems Inc., 48431 Milmont Dr., Fremont, CA 94538; 800-628-3837, 415-498-1111.

CIRCLE 443 ON READER SERVICE CARD

Nanao Offers 17-inch High-Resolution Monitor

NEW Nanao has released the T560i, the first in a line of monitors aimed at CAD/CAM and desktop graphical applications. The 17-inch monitor offers a CRT trio pitch of 0.26 mm, and displays images at resolutions up to 1,280 by 1,024 noninterlaced at vertical refresh rates over 70 Hz, and complies with both TCO and MPR II Swedish government magnetic radiation emissions standards.

The T560i is one of several "intelligent" monitors that offer a set of front-panel controls for horizontal and vertical screen positions, brightness, contrast, static convergence, and side pin-cushion and trapezoidal distortion. Up to 32 user-defined settings can be saved and restored.

The multiscanning monitor synchronizes to vertical refresh rates between 30 and 78 Hz

CONTINUES ON PAGE 66

The dot matrix era is over.

Canon



November 26, 1991
Canon BJ-300 Bubble Jet Printer
Canon BJ-330 Bubble Jet Printer

No one will miss dot matrix printers, such a noisy bunch they were. But for a long time, they were the only way to produce decent quality output.

Now the Canon Bubble Jet™ era has begun and you can get extraordinary print quality quickly and quietly. When we say extraordinary, we're quoting reviews of Canon Bubble Jet printing. By quietly, we mean you can work next to one and be virtually unaware it's there.

Our ultrafast BJ-300 and BJ-330 Bubble Jet printers print up to 300 cps at 10 cpi through 600 cps at 20 cpi in High Speed mode. They deliver up to 360 dpi resolution on a variety of paper, including transparencies and envelopes. And regardless of paper orientation, the BJ-300 prints on letter-size paper to a maximum print width of 8" while the wide-carriage BJ-330 prints on 11" x 17" paper to a maximum print width of 13.6". Plus, both printers come with built-in fonts (plus optional font cards) to give you even greater creative control.

And, because they have both IBM® and Epson® emulations, you can use virtually any software.

Best of all, they're every bit as rugged and simple to use as dot matrix printers.

So for the price of a 24-pin dot matrix, you can now get printers that are better for your image and for your ears. The Canon Bubble Jet printers.

The document displayed in the BJ-300 is actual output using the UltraScript™ pc plus software Epson printer driver. • Canon® and BJ® are registered trademarks and Bubble-Jet is a trademark of Canon Inc. • IBM® is a registered trademark of International Business Machines Corp. • Epson® is a registered trademark of Seiko Epson Corp. • UltraScript is a trademark of QMS. • PC Magazine Editors' Choice logo is a trademark of Ziff-Davis Publishing Co. © 1991 Canon U.S.A., Inc.



CIRCLE 169 ON READER SERVICE CARD

Canon
BUBBLE JET PRINTERS
BJ-300/330

Working To Improve Your Image.™

For information on any of Canon's full line of Bubble Jet printers, call 1 (800) 848-4123.

New & Improved

BRIEFS

CONTINUED FROM PAGE 64

diagnostic trace facilities. The DDE feature allows the asynchronous communications package to create links to other *Windows* programs and to build specialized applications in *Windows* languages like Visual Basic. The command line interface gives DOS users a familiar interface under *Windows* while still letting them reap the benefits of working under the integrated environment. 800-426-6283; 206-644-4010.

Interactive has announced an e-mail package that allows users to send sound and pictures, including animations, across a Novell *NetWare* network. *InterActive M-Mail* (\$295 for two users), which the company is calling a multimedia mail system, works on top of *Multimedia Windows*. The system offers a push-button front end that allows users to send integrated multimedia clips to others on the LAN. 800-292-2112, 605-363-5117.

CompuCom is now shipping its *Remote Pro* (\$59), a low-cost PC-to-PC remote-control package. The software is also bundled with the company's *Speed-Modem Champ*, a \$149, 9,600-bps modem. 800-228-6648, 408-732-4500.

Ocean Isle Software is now offering a *Windows* version of its remote-control software. *ReachOut* (\$195) supports all *Windows* modes and remote mouse operation. DOS-to-DOS and DOS-to-*Windows* operation are also possible. *ReachOut* either operates in an interactive chat mode or takes control of a remote PC keyboard and monitor. 407-770-4777.

Eclin Technology is now shipping *Eclin Connect 2.0* (\$49; upgrades \$29). The package has added the Zmodem, Ymodem-G, and Ymodem-G batch transfer protocols, support for 16550 UART fast serial ports, and an auto-sensing feature that senses which port is being used. *Eclin Connect* has a background transfer mode that uses 45K of RAM, can swap out to EMS or disk, a scripting language, a text editor, a call-tracking spreadsheet mode, and a program-launching feature. 609-393-0577.

CONTINUED FROM PAGE 64

and is compatible with all VGA, SVGA, XGA, 8514/A and ultra-high-resolution graphics adapters.

Also included in the "intelligent" line are Nanao's 21-inch FlexScan F750i, 14-inch T240i, and T660i, all flat-screen monitors that offer the user-defined screen mode feature.

List Price: T560i, \$2,699. **Requires:** Video adapter. Nanao USA Corp., 23535 Telo Ave., Torrance, CA 90505; 800-800-5202, 213-325-5202.

CIRCLE 444 ON READER SERVICE CARD

DOS Menu System Adds Software-based Security

IMPROVED Offering protection to both command sets and data, **PC Dynamics'** *MenuWorks Advanced* now protects PCs using a software version of the Department of Defense's Data Encryption Standard (DES), a code that has so far foiled all attempts to scramble it.

MenuWorks Total Security allows you to create up to 99 levels of password protection, restricting access to files, programs, or DOS commands. A keyboard lock during boot-up prevents intruders from bypassing security features. Because the product can restrict disk reads and writes, it also functions as a rudimentary virus-detection utility. Since DES encrypts data on the fly, booting from a floppy disk will not bypass the system.



MenuWorks Total Security uses a software version of DES.

Legislation requires that DES be used in hardware for any sensitive government work. PC Dynamics offers a data-encryption coprocessor board that meets that requirement.

MenuWorks Advanced is a full-function graphical DOS menuing system, allowing users to automate DOS tasks, launch programs, and view disk contents in a variety of formats.

List Price: *MenuWorks Total Security*, \$149. **Requires:** 512K RAM, DOS 3.1 or later. PC Dynamics Inc., 31332 Via Colinas, #102, Westlake Village, CA 91362; 800-888-1741, 818-889-1741.

CIRCLE 445 ON READER SERVICE CARD

Compaq Speeds Network Nodes, Adds SVGA

IMPROVED Compaq Computer Corp. has introduced a 20-MHz 386SX version of its diskless workstation. The company has also announced that the Compaq Deskpro 386s/20n will incorporate its Advanced VGA, which uses a graphics coprocessor and displays 256 colors at 640-by-480 resolution, and 16 colors in 800-by-600 resolution.

The 386s/20n comes in three configurations. The Model 60 incorporates a 19-ms, 60MB hard disk and a 3.5-inch 1.44MB floppy disk drive. Model 1 has only the hard disk; Model 0 is diskless. All Compaq network nodes support remote booting from the network.

All models are small footprint, 3.9 by 15 by 14.9 inches (HWD). Units come with 2MB of RAM, two ISA slots, and two drive bays. The 386s/20n can support up to 16MB on an ISA expansion card.

List Price: 386s/20n Model 60, \$2,199; Model 1, \$1,699; Model 0, \$1,599. Compaq Computer Corp., 20555 SH 249, Houston, TX 77070; 800-345-1518.

CIRCLE 446 ON READER SERVICE CARD

Universal Compression Hardware Squeezes SCSI Disks

NEW ECCS has announced a pair of SCSI I and II hard disk add-ins that provide transparent 2:1 data compression and effectively double disk access time. The separate products, called Space Maker and Space Module Turbo, respectively, are daughtercards that can be attached to all SCSI hard disk controllers, according to ECCS.

The Space Maker contains its own dedicated processor, a fast RAM cache, and a VLSI compression chip that uses the DCLZ compression algorithm. The card attaches directly to the controller and intercepts all data directed to that drive. Prices depend on the size of the intended drive. Configurations currently available range from 300MB to 1.5GB and above.

ECCS claims that the Space Module Turbo accelerator card cuts disk access time in half. The card works like the Space Maker, intercepting data transparently to the user. ECCS will be shipping the Space Module with all of its SCSI-based drives, but it will operate with any SCSI drive on the market.

List Price: Space Maker, \$1,250 for 300MB drive; \$2,995 for 1.5GB and above. Space Module, \$995. **Requires:** SCSI or SCSI II hard drive. ECCS Inc., One Sheila Dr., Bldg. 6A, Tinton Falls, NJ 07724; 800-322-7462, 908-747-6995.

CIRCLE 447 ON READER SERVICE CARD

telemart

Season's Greetings



HiJaak 2.1

HiJaak 2.1 is the graphics conversion and screen capture utility that translates more than 43 graphics file formats and captures DOS and Windows screens.

\$99

OCR/SCANNERS

HARDWARE	
Complete Full Page GS/W Wordscan	\$639
Half Page 400 DPI	175
DFI Scanner HS-3000+	145
Logitech Logi Scanman 256 for PS/2	289
Logi Scanman 256	259
SOFTWARE	
CAT Reader Pro 1/2 Page	\$155
CAT Reader Pro Full Page	225
Complete OCR/PP	289
Complete OCR/PP + 400	175
DFI OCR Deluxe	90
OmniSpell	64
OmniProof	96
OmniDraft	64

TERMINALS

Wyse 30+	\$280
60	285
150	269
160	335
185	349



WordPerfect 5.1™ for DOS

Offers pull-down menus, mouse support, Tables, an Equation Editor, spreadsheet links, and the ability to print all characters in the WordPerfect character sets, and still runs on just 384K.

\$239

DISKETTES/TAPES

Sony 3.5 D/S D/D (100)	\$70
3.5 H/D (100)	130
5.25 D/S D/D Disks (100)	50
5.25 High Density (100)	87
Sony Tape	
150 MB/5.25	20
20-40 MB/3.5	15
60 MB/5.25	19

HARD CARDS

Plus Development II XL50 MB	\$365
II XL165 MB	595
Other Models	Call

PCM123191

MONITORS

Amdek All Models	Call
Aamazing 12" MM 1288	75
14" MM 1488	99
14" CM 8484 EX	315
Mitsubishi XC 1410 C EGA	269
XC 1429 C VGA	385
Other Models	Call
NEC Multisync 2A	389
Multisync 3FGX 14"	629
Multisync 4FG 15"	759
Multisync 5FG 17"	1345
Multisync 6FG 20"	2799
Princeton Princeton Ultra 1400	449
Princeton Ultra 1600	639
Sony Multiscan 1304 HG 14"	605
Zenith ZCM 1492	599



WordPerfect Executive™

WordPerfect Executive combines spreadsheet analysis, word processing, and information/bme management into one package. Also included are a Calculator, Appointment Calendar, Note Cards, and Phone Directory.

\$134

CO-PROCESSORS

Cyrix 80387-DX 16	\$170
80387-DX 20	170
80387-DX 25	170
80387-DX 16	185
80387-DX 40	209
80387-SX 16	105
80387-SX 20	119
80387-SX 25	129
Others	Call
Intel 80C287 XLT (For Pens CF270)	79
80387-DX 33	199
80387-SX 16	119
80387-SX 20	130
Others	Call

KEYBOARDS

Keytronic KB5151	\$115
KB101Plus	95



Epson LQ-570

The LQ-570 replaces the popular LQ-510 printer,

- offering faster print speeds
- scalable fonts
- enhanced graphics
- new case design
- four paper paths
- automatic paper-handling features



\$269

WINDOWS

ACCIPAC Simply Accounting	\$117
Adobe Illustrator Windows	305
Adobe Streamline Windows	119
Adobe Type Manager Windows	59
After Dark	27
Ami Pro 2.0	275
Asymetrix Toolbook	279
Becker Tools	72
Borland C++	289
Charisma	320
Corel Draw 2.0	359
Crosstalk for Windows	115
Current by IBM	211
Designer	442
Dratix Ultra Windows	407
Facelift for Windows	59
Facelift for Windows ValuePak	117
Form Base w/Windows	295
Form Publisher	115
Grammatik for Windows	55
hDC FileApps for Windows	69
hDC FirstApps for Windows	53
hDC ICON Designer	32
hDC Windows Express	49
Lotus 1-2-3 for Windows	\$399
MS Entertainment Pack	24
MS Excel for Windows	293
MS PowerPoint for Windows	293
MS Productivity Pack	36
MS Project for Windows	412
MS Word for Windows	293
Norton Desktop	95
Norton Backup	82
Objectvision	87
Omni Page 300	432
On Target	253
PC-Kwik Power Pak	69
PageMaker 4.0	479
PerFORM Pro	260
PFS Professional Write Plus	159
Read Write Windows	279
Superbase 4	475
Ventura Publisher Gold/Windows	469
WinConnect	59
WINFAX Pro	70
WordPerfect for Windows	259
Wordscan 286/386	215
Wordscan + 286/386	649



OFFICE ON THE GO

LAPTOP	NOTEBOOK
Acer 1100LX 40mb 386SX	ALR Venture 16 386SX
1100LX 120mb 386SX	16 mhz 20MB
Epson Equity Portable LT-386sx	Aluma NSX386SX 20MB
Leading Edge LT386+	AST Esse 386SX 40MB
Microsoft MS BallPoint Mouse	Epson NB3-S 20mb
MicroSpeed MicroTrac	NB3-S 40mb
Thumbelina Portable	Everex Tempo LX 386SX 20
Sharp PC-5541	Leading Edge 386SX 16 20mb
Toshiba T-1000 XE	386SX 20 30mb
T-1200 XE	Other Models
Other Models	Call
PALMTOP	NoteStar 386SX-16 60 MG, VGA DOS
Poquet Hand Held	2069
Sharp Wizard 02-8000	Panasonic CF-170
	CF-270
	CF-370
	Texas Instruments 2000 20MB
	3000 20MB
	3000 40MB
	3000 60MB

CD ROM

NEC CD ROM INT CDR 36 XT/AT w/int	\$499
CD ROM EXT CDR-36 Reference	565
CD ROM EXT CDR-73 Reference	805
CD ROM EXT CDR-73	685
CD ROM INT CDR-83	625
Panasonic Worm 940 MB	2125
Sony CD ROM INT	419
CD ROM EXT	479
Toshiba CD ROM RDR w/SCSI EXT	\$509
SOFTWARE	
Accumail	\$110
Atlas Pak	63
World Atlas	46
US Atlas	46
Grolier's Electronic Encyclopedia	209
Grolier's Illustrated Encyclopedia	250

NETWORKING & LAN

SOFTWARE	HARDWARE
Above LAN	\$235
ACCIPAC BPI LAN	230
Data Ease LAN 3-Pak	509
DBase IV Lan	609
Direct Access Network Unlimited	355
Flexbase Plus LAN	269
FoxPro Lan 2.0	739
Harvard Graphics LAN Server	408
MS Excel Exec License Pack	234
MS Word License Pack	174
Novell NetWare 286	485
Novell NetWare 386	1379
Paradox 3.5 LAN	198
PC Anywhere IV LAN	260
O & A Network Pack	319
Anthem NE1000	\$149
NE2000 w/o cable	159
Artsort Lantastic 2MBPS Starter	330
Lantastic Ethernet Starter	499
Novell SNA Gateway ELS	395
Synchronous Adaptor	259
Standard Microsystems All Other Models	Call
Tierra All Other Models	Call
Western Digital Ethercard Plus 8 bit Elite	135



CAD & ENGINEERING

Auto Sketch 3.0	\$141
Design CAD 3-D	189
Generic CAD 5.0	279
Generic CAD Starter Kit Level II	85
Math CAD	299
Summasketch 12x12 II	329
Summasketch 12x18 Pro II	580
Summasketch 12x18 Pro II 4 Button	580
Summasketch 12x18 Pro II 16 Button	595
Turbo Cadd	76
CalComp 33120-34 Dig12x12 16B	299
33120-34 Dig12x12 4B	289
33180-4 Dig12x18 4B	599



*Decade
of Experience*

SHIPPING

Most orders shipped
in 24 hours...
with FREE Federal Express



You pay the ground
shipping, we pay the
air difference!

PRICE



A decade
of lowest prices
on the products
you want

CONFIDENCE



You can depend upon
receiving your product
in a timely and secure
manner. We won't
charge your card until
we ship your order.

CONVENIENCE



Extended hours:
late nights,
Saturdays
and Sundays

SELECTION



When you see this
symbol, you're
assured that these
products have been

purchased most often by our
national customer base, based
on performance and the
telemark price.

CALL US FOR CUSTOMIZED ACCOUNT SERVICES

International Orders:
Direct 1-602-944-3045
Fax 1-602-944-1510
Canada 1-800-752-0590

National Accounts:
1-800-521-1970

Major Accts & Resellers
1-800-521-1982

Systems & Networks:
1-800-335-4310

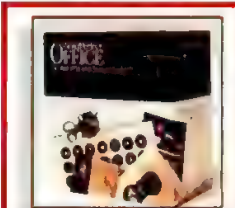


DISK DRIVES

Archive	
55801 80/125MB w/Tape	\$285
Conner	
42MB 28MS IDE	179
104MB 25MS SCSI	359
Iomega (Bernoulli)	
Beta 44 MG Transportable	869
Beta 88 MG Dual 44	1655
Beta 44 MG Insider	775
180 MB Dual 90 5.25 EXT.	1549
Other Models	Call
Maxtor	
7080 80MG IDE w/CNT	315
LXT 213A 200MG IDE w/CNT	629
Microplus	
385MB SCSI HH	1055
Other Models	Call
Mountain	
TD-4340 40MB INT	225
TD-4440 40MB EXT	435
Seagate	
ST1102A 89 MG	305
ST1144A 124 MG	409
Other Models	Call
Teac	
3.5" 144 MG AT	59
5.25" 12 MG AT	59
Toshiba 3.5 1.4 MG	65

ACCOUNTING

ACCPAC BPI	
AP, AR, GA, INV. Payroll	\$230
ACCPAC Bedford Accounting	117
DAC Easy Accounting 4.2	79
DAC Easy Bonus Pack 4.2	122
DAC Easy Payroll 4.2	53
One Write + Acctg. System	167
One Write + Payroll	60
Pecio 2000	28
Peachtree III w/Data Query	211
TimeSlips III 4.0	185



WordPerfect Office™ LAN

Includes eight desk accessory
WordPerfect-compatible
programs---Shell, Calendar,
Calculator, Notebook
scheduler, E-Mail, File Manager,
and Macro/Program Editor

5-PACK \$279

20-PACK \$870

POLICIES

- Order Line Hours:
Mon-Fri 9am - 10pm
Sat 9am - 5pm, Sun 10am - 3pm
- In Arizona Call (602) 944-0402
- Order Processing (602) 944-1037
10am - 3pm Mon-Fri
- Mailing Address
Telemark, 8804 N. 23rd Ave. Phoenix AZ 85021
- We accept International Orders
Call our Fax at (602) 944-1510.
- International orders add 6%
- Call Before Submitting P.O.'s Ask for National Accounts
- Personal and company checks will delay
shipping 3 weeks
- Prices, terms, availability & specifications are
subject to change without notice
- Add 5% for C.O.D., A.P.O. & F.P.O. Orders
- Money Back Guarantee
Software ONLY 30 days from date of invoice
Refund ONLY on Product Price Call for Return
Authorization Number
- Must be in Original Packaging
- No Charge for VISA and Mastercard
- We Do Not Charge Your Card Until Your Order
is Shipped
- You Pay the Ground Shipping
1-lb - \$8.00 11-lb - \$12.00 (Except Alaska &
Hawaii)
- We Pay the Air Difference and Free Air Applies
ONLY to Domestic Orders Over \$100
- All products, including DGA's carry only
manufacturer's warranties. We do not honor
guarantees, rebates, trial period privileges or
promotional programs offered by
manufacturers
- No returns on used or misordered product
- We do not guarantee machine compatibility
- Machine compatibility disclaimer does not
apply to MIT systems



WordPerfect 5.1™ for DOS

Offers pull-down menus, mouse
support, Tables, an Equation
Editor, spreadsheet links, and
the ability to print all characters
in the WordPerfect character
sets, and still runs on just 384K.

\$69

PRINTERS

LASER

Canon	
LBP-4 Laser	\$789
Epson	
7000 Laser	809
7500 Laser	1935
Action Laser	725
Hewlett Packard	
Laser Jet HP	849
Laser Jet III	1569
Laser Jet III P	1879
IBM	
LaserPrinter (5 ppm)	905
NEC	
Silentwriter II Model 90	1525
Dixdata	
DL-400 Par	629
DL-800	899
DL-840	1555
Panasonic	
4420 Laser w/CART	1779
QMS	
PS 410 Laser	1735
Texas Instruments	
Micro Laser Postscript 17 Font	1199
Toshiba	
All Models	Call

DOT MATRIX

Citizen Printer	
200GX-15	295
GSX 130	245
GSX 140	299
HSP 500	310
Other Models	Call
Epson	
FX 850	299
LQ570	269
LQ1170	639
LX810	159
Other Models	Call
NEC	
P3200	269
P6300	635
P3300	885
Dixdata	
182 Turbo	225
321 ML Par	445
390 Plus	445
393 Plus Color	1009
Other Models	Call
Panasonic	
1123	209
1124	279
1624	365
1695	379
Other Models	Call
Star Micronics	
NX 1001	145
NX 1020 Rainbow	190
Other Models	Call

OTHER

Canon	
BJ-10EX	\$335
Dixcon	
150 Plus	\$330
Seiko	
Smart Label + Printer	165
SOUND BOARDS	
Creative Labs	
Sound Blaster	\$105
Sound Blaster Pro	185
Ad Lib	
Music Synthesizer Card	72

TAPE BACKUP

Colorado Memory System	
Jumbo 120 250	\$290
Jumbo 60/120 INT	135
Irwin	
40/120 MG Internal	209
80/250 MG Internal	299

SPREADSHEET

Lotus 1-2-3 Ver. 2.3	\$325
Lotus 1-2-3 Ver. 3.1 +	399
Lotus 1-2-3 Ver. 3.1 Live Upgrade	105
Lucid 3-D v2.2	30
Plan Perfect 5.1	225
Quattro Pro	305
Supercalc	89

BOARDS

ATI	
VGA Wonder XL 256K	\$165
VGA Wonder XL 512K	189
Diamond	
Speed Star Hi-Color	179
Speed Star Plus VGA	169
Everex	
RAM 3000 Deluxe	79
RAM 8000	175
Hercules	
Graphics Station 1 MB	515
Other Models	Call
Intel	
Above Board + 512K Plus	275
Above Board + w/2MG P/S	445
Above Board + w/2MG	409
Imboard 386 PC (1MG)	479
Other Models	Call
Orchid	
Tiny Turbo 285	115
Tiny Turbo Xtra	175
Other Models	Call
Paradise	
VGA + 256K	105
VGA + 16	125
VGA 1024 512K	190
Video 7	
1024 i w/256K	125
Other Models	Call



WordPerfect for Windows™

WordPerfect for Windows is a
powerful CUA compliant word
processor containing all of the
capabilities of WordPerfect 5.1
for DOS, as well as new
features that take full advantage
of the Windows graphical user
interface.

\$259

MICE

Kensington Expert Mouse Bus	\$110
Logitech Mouseman Serial	
Right Handed	59
Logitech Mouseman Serial	
Cordless	102
Logitech Trackman Serial	75
Logitech Trackman Portable	93
MS Ballpoint Mouse	118
MS Bus or Serial w/Windows 3.0	142
Microspeed PC Trac Bus	82
Microspeed PC Trac Ser or PS/2	70
Mouseman Pro - PC	61
Omni Mouse II Bus	48
Omni Mouse II Serial	37

WORD PROCESSORS

LetterPerfect	\$129
MS Word 5.5	203
Q & A Write	127
Right Writer 4.0	53
WordPerfect 5.1	239
WordPerfect Office	77
WordPerfect Rhyme	46
Wordstar 6.0	185



LetterPerfect 1.0™

LetterPerfect is an entry-level
word processor fully compa-
tible with WordPerfect 5.1 With
on-line help, pull-down menus,
macros, graphics integration,
and a spell and thesaurus,
LetterPerfect is ideal for laptop
computers

\$129

COMMUNICATION HARDWARE

ATI	
2400 ETC INT w/SW	\$129
2400 ETC EXT	149
Cardinal	
2400 INT w/MNPS	115
2400 INT	55
Other Models	Call
Complete	
4800	109
9600	235
Communicator	280
PC Portable Fax	295
Everex	
Evercom 12 INT	49
Evercom 24 INT w/MNP	85
Everfax24/96 INT	255
Other Models	Call
Hayes	
1200 B	135
2400 B	225
2400 EXT	319
2400 + Personal Modem	130
Pocket Edition 2400	109
9600V Series EXT	485
Other Models	Call
Intel	
2400 B Classic	135
2400 EXT	165
2400 PS/2	219
Satisfaction Classic	310
Practical Peripheral	
2400 B w/Quicklink	79
2400 INT w/MNP	159
2400 SA	195
9600 SA	449
Pocket Modem	105
Other Models	Call
Prometheus	
2400 B w/Software	59
2400 EXT	145
Pro Modem 9600 + EXT	695
Other Models	Call
U.S. Robotics	
Courier 2400 EXT	265
Courier 2400 (MNP)	315
Courier Dual Standard EXT	799
Courier HST/PC INT 14.4	559
Courier HST 14.4 EXT	559
Zoom	
2400 EXT V.42 Bis	119
2400 EXT	65
2400 EXT w/4800 fax	69
2400 EXT w/9600 fax	75
2400 INT w/9600 Send/Rec	105
Other Models	Call



WordPerfect Office PC 3.81™

Includes six desk accessory
WordPerfect-compatible
programs---Shell, Calendar,
Calculator, Notebook with auto-
dial feature, File Manager, and
Macro/Program Editor.

\$77

COMPUTERS

DESKTOP

ALR	
Business Versa 386/33 #101	\$1619
Power Flex 286-40MG	905
AST	
All Models	Call
Compaq	
386 20E Model 1/3.5 DR	2339
386 20E Model 80/3.5 DR	3759
386S Model 1/3.5 DR	1795
IBM	
Model 30/286-E01	1389
Model 30/286-E21	1445
Model 30/286-E31	1695
Model 55SX-D61	2479

MIT SYSTEMS

All systems come with 1 MB 5.25"
Floppy Drive, 1 MB RAM, Parallel, 2
Serial, Game ports, DOS 5.01 and Focus
2001 Keyboard

286-16 w/ 14" VGA, 52MB HD	\$389
386S/20/32C w/ 14" VGA 52MB HD	1189
386-33/128C, 2MB, 130 MB HD, 14" SVGA	1789
Multi Tower	1789
386-40/128C, 2MB, 130 MB HD, 14" SVGA	2189
Midi Tower	2189
486-33/256C, 4MB, 14" SVGA, 340 MB HD, FullTower	3359

INTEGRATED SOFTWARE

Lotus Symphony 2.2	\$465
MS Works	89

1-800-521-1973

PERSONAL FINANCE

Money Matters v2.0	\$36
Quicken 4.0	36
Tobias Managing Your Money v.7.0	89
Wealth Builder	69
Wealth Starter	33

LIST MANAGEMENT

Address Book Plus	\$49
Avery Label Pro (Laser or Dot Matrix)	45
Avery List & Mail Plus	36
Labels Unlimited	55



Smartmodem™ OPTIMA 9600 v.32

Low cost, high-speed V.32 modem saves you time and money 9600/2400/1200/300, free software, error-control, and data compression.

\$479

UTILITIES

BACK UP

Back It 4	\$72
Central Point Backup	75
Fastback Plus 3.0	118

GENERAL

Check It! 3.0	\$79
Copy II Option Board Deluxe	106
Copy II PC 6.0	23
Norton Editor	65
SPF/PC	143
Super PC-Kwik	43

HARD DISK MANAGEMENT

Lotus Magellan	\$79
Mace Utilities 1990	89
Norton Utilities 6.0	110
PC Tools Deluxe 7.0	96
QDOS III	41
SpinRite II	56
XTree Gold 2.5	89

LAPTOP

Battery Watch Pro	\$27
Brooklyn Bridge	82
Laplink Pro	85
VGA Dimmer	23

MEMORY MANAGEMENT

Headroom	\$66
Move 'Em	45
Umm 386	58

MENUING SOFTWARE

Auto Menu	\$35
Direct Access	61
Power Menu	80

PRINT

Go Script Plus	\$175
Impress 2.1	69
Print Q v5.0	79
Sideways v.3.3	54

SCREEN SAVERS

After Dark	\$27
Intermission	27



CorelDraw 2.0

Award winning graphics package of choice for business people, artists and home users. Fill, pattern or color to create the finished graphics. Includes over 150 fonts and more than 4000 clip art images and symbols.

\$359

OPERATING ENVIRONMENTS

Carousel v5.0	\$53
Desqview 386	129
MS Windows Ver. 3.0	89

PROFESSIONAL DESKTOP PUBLISHING

Freedom of Press	\$235
Pagemaker 4.0	479
Ventura Pub Gold/GEM	469

DOS

Dr. DOS v6.0	\$64
MS DOS 4.01	69
MS DOS 5.0 Upgrade	59
MS DOS 5.0 OEM	59

PRESENTATION GRAPHICS

Animator	\$265
Corel Draw 2.0	369
Drefix Ultra v4.0	232
Harvard Graphics 3.0	325
Lotus Freelance Graphics 4.0	309



PlanPerfect 5.1™

Offers multiple interfaces (pull-down menu, function key, and slash command), versatile printing, flexible graphing and charting, and increased calculation speed, as well as macros and unlimited linking of spreadsheets.

\$225

PROGRAMMING & LANGUAGES

MS Basic Pro Development System	\$283
MS C Compiler	283
MS Cobol Compiler	534
MS Fortran Compiler	266
MS Macro Assembler	89
MS Pascal Compiler	178
MS Quick Pascal	59
MS Quick Basic	59
MS Quick C	59
MS Visual Basic	119
Turbo C + +	64
Turbo Pascal Pro 6.0	185



PictureEze

PictureEze is the WINDOWS graphic file format converter. Use PictureEze when you need to import a graphic image into a WINDOWS or DOS applications

\$90

FORM PROCESSING

Form Filler 3.0	\$79
Formool Gold 3.0	53
PerFORM Filler	76
PerFORM 2.1	88

GRAPHICS

Hijack v.2.02	\$99
PC Paintbrush IV	56
PC Paintbrush IV Plus	112
Printmaster Plus	32



DrawPerfect 1.1™

Offers presentation, graphing, drawing, and text-handling capabilities to create visual aids for oral and written presentations. Also includes a figure library of more than 500 images.

\$259

DATA BASE MANAGEMENT

Ask Sam v5.0	\$209
Clarion	
Personal Developer	43
Professional Developer	449
Clipper 5.0	499
Data Perfect	275
Dbase IV	449
Foxbase Plus Single User v2.0	182
FoxPro Single User 2.0	455
Paradox 3.5	495
Personal R-Base	92
Q&A	249
R-Base 3.1	455
Revelation Advanced	699

TIME MANAGEMENT

Act! v2.0	\$275
Calendar Creator Plus	48
Quick Schedule Plus	59

ELECTRONIC MAIL

CC Mail	
Platform Pak (Windows)	\$375
Platform Pak (DOS)	125
6-User	122
25-User Expandable	375
WordPerfect Office LAN	82



WordPerfect for Windows™

WordPerfect for Windows is a powerful CUA compliant word processor containing all of the capabilities of WordPerfect 5.1 for DOS, as well as new features that take full advantage of the Windows graphical user interface.

UPGRADE

\$79

FONT CARTRIDGES

Pacific Data 1-2-4 Plus 2 MG.	\$235
Pacific Data 1-2-4 Plus 4 MG.	350
Pacific Data 25 IN 1 III	259
Pacific Data 4 Memory 1MB	97
Pacific Data 4 Memory 2 MB	131
Pacific Data 4 Memory 4MB	235

PROJECT MANAGEMENT

Harvard Project Mgr III	\$425
Lotus Agenda 2.0	269
Org + Advanced	59
Timeline 4.0	435

COMMUNICATIONS

Carbon Copy Plus 6.0	\$110
CompuServe Membership Kit DOS	19
CrossTalk Communicator	53
Crosstalk Mark4	132
Procom Plus v2.0	62

PCM123191

telemart

Shipping

Telemart's commitment to low prices and excellent customer service are only part of the way Telemart does business. And Telemart has a reputation for getting your purchase to you fast.

Over the past decade, Telemart pioneered not only the direct marketing of computer products but the shipping and delivery of those products as well. In fact, in conjunction with Federal Express, Telemart initiated the use of overnight air delivery via Federal Express for your micro-computer product delivery. During this time, Telemart has developed and implemented new ways to improve the shipping and delivery process. Since Telemart has grown and expanded its daily number of shipments, they have been able to pass along savings to you in the form of lower delivery rates.

Telemart offers same day shipping on most orders placed by 2:30 pm and if for some unlikely reason your order doesn't ship out within 48 hours, **YOU WILL BE NOTIFIED**. Telemart always does it's best to keep you informed about your shipped product.

As a valued customer, Telemart charges you ground rates while Telemart pays the air difference. This means that you only pay the normal ground rate (up to 20 lbs.) and Telemart pays the Federal Express difference.

Ask what options are available for expediting your order, Telemart has several. Overnight delivery is one of these options. Call for the delivery details.

Telemart International customers are exclusively serviced as Federal Express delivers to most international destinations everyday. And to ensure that your purchase is not delayed, Federal Express will clear your package through customs and deliver it directly to your door.

As you can see, Telemart has developed an efficient shipping system. It is Telemart's continued goal to make your buying experience as simple and pleasurable as possible.

TELESMART HAS OVER 5,000 TITLES. IF YOU DON'T SEE WHAT YOU'RE LOOKING FOR, CALL US!

Project Scheduler 5™

The #1 power planner
the competition
didn't plan on.

REPORT CARD		INFO WORLD					
Mainstream Project Management Software							
	(InfoWorld weightings)	Harvard Project Manager Version 3.02	Instaplan 5000 Version 2.0	Microsoft Project for Windows Version 1.0	Project Scheduler 5 Version 1.0	Superproject Expert Version 1.1	Time Line Version 4.0
Price		\$695	\$540	\$105	\$95	\$195	\$195
Performance							
Features and flexibility	(100)	Satisfactory	Good	Very Good	Excellent	Very Good	Very Good
Rescheduling/resource leveling	(100)	Satisfactory	Satisfactory	Good	Excellent	Very Good	Very Good
Speed	(75)	Satisfactory	Very Good	Excellent	Very Good	Very Good	Satisfactory
Reporting	(100)	Good	Good	Good	Very Good	Very Good	Very Good
Document editing	(75)	Very Good	Good	Very Good	Very Good	Good	Very Good
Ease of learning	(100)	Very Good	Very Good	Very Good	Very Good	Good	Very Good
Ease of use	(125)	Good	Good	Very Good	Excellent	Good	Good
Error handling	(75)	Good	Good	Satisfactory	Very Good	Good	Very Good
Support							
Support policies	(50)	Good	Good	Very Good	Good	Good	Very Good
Technical support	(50)	Very Good	Very Good	Satisfactory	Excellent	Satisfactory	Very Good
Value	(75)	Satisfactory	Good	Very Good	Excellent	Very Good	Very Good
Final scores		6.0	6.4	7.1	8.7	6.8	7.1

Source: InfoWorld, November 26, 1990

See how Project Scheduler 5
fits into your plans. Call or write:

415/570-7700

393 Vintage Park Drive, Suite 140
Foster City, CA 94404

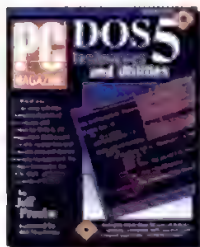
Scitor
Corporation

edited by
Carol Levin

Read Only

Reviews of the Latest Books for the PC User

PC Magazine DOS Guide Speaks To Both Programmers and Users



It's rare that one book on DOS can explain the DIR command as well as the intricacies of DEBUG or INT 21h

services with equal dexterity. Rather than writing solely for either programmers or users, Jeff Proise, a contributing editor and author of *PC Magazine's* Tutor column, breaks down the artificial barrier between using and programming DOS. *PC Magazine DOS 5 Techniques and Utilities* covers the entire spectrum of DOS activities, from changing your CONFIG.SYS file to writing interrupt handlers in assembly language.

Proise's approach is a daring concept, but it works. He guides you through configuring DOS 5.0 for maximum memory (no easy task); using DOS's nifty new command line switches; creating new commands with batch files and the DOSKEY utility; creating tiny programs with DEBUG scripts; writing assembly-language batch-file enhancers; and assembling sophisticated memory-resident programs.

Interestingly, the book from ZD Press (a division of Ziff Communications, the parent corporation of *PC Magazine*) does not make any straightforward progression from using to programming. Throughout the book, Proise treats writing batch files, using command lines writing programs, and creating macros or scripts as the same sort of activity.

This approach is a welcome change from the usual fare in computer books. Even for users

who have absolutely no desire to write programs, Proise's strategy combats the vagueness usually found in DOS books. For example, in the middle of describing the multitude of options and switches to EMM386, Proise explains Intel's "virtual-8086" mode. Instead of the usual hand-waving references to "mapping," Proise provides a concrete explanation of page tables on the Intel 80386 and 80486.

Two accompanying disks include a collection of utilities, complete with assembly-language source code tutorials. For fans of *PC Magazine's* Productivity section, getting the disks along with the book is like getting a vast Utilities and Tutor column. At first glance, *PC Magazine DOS 5 Techniques and Utilities* might remind you of the massive collection of utilities found in *PC Magazine DOS Power Tools* (see the sidebar "New Edition of *DOS Power Tools*"), but Proise does more than dump utilities on your hard disk. He shows the assembly-language source code and explains how it all works in an

New Edition of DOS Power Tools

Paul Somerson's *DOS Power Tools* (Bantam Books, \$49.95) has been updated to reflect the changes to DOS, Version 5.0. It's also had a radical change of software: In this edition, *PC Magazine* utilities



are not included on the book's disks. Instead, Somerson has substituted a variety of shareware and public-domain programs. All *PC Magazine* utilities can be downloaded from

PC MagNet.—Gus Venditto

"Inside" section for each utility. And almost all the utilities in Proise's book are new and have not appeared in *PC Magazine*.

A few things about this superb book did surprise me. A 100-page "DOS command reference" seems unnecessary, as does the nearly exclusive use of assembly language and .COM files. More BASIC (there's only one example in BASIC, albeit long, for a maze game!), Turbo Pascal, or C would make certain aspects of the programs more easily understood.

Still, Proise's writing is so clear that he could probably get away with writing source code in Latin. This book is an excel-

lent tutorial both for users who want to understand how PC utilities really work and for programmers who want to write great DOS software.

—Andrew Schulman

PC Magazine DOS 5 Techniques and Utilities

by Jeff Proise, \$39.95, Ziff-Davis Press, 5903 Christie Ave., Emeryville, CA 94608; 800-688-0448, 415-601-2000. ISBN: 1-56276-007-6.

CIRCLE 396 ON READER SERVICE CARD

Andrew Schulman is an engineer and writer at Phar Lap Software and a contributing editor to Dr. Dobb's Journal.

Computer Industry Language Explored from Two Perspectives

Hello world of bitty box (a.k.a. PC) hackers! The gonzo, collective brain dump that is *The New Hacker's Dictionary* officially embraces the jargon coined by the new hackish culture developed around hackers for boxes with fewer computrons, like the MS-DOS variety. Though especially aimed at the younger members of the hacker community, this book should appeal to everyone who has learned to appreciate bulletproof programming.

Editor Eric Raymond is a Unix man and new-generation hacker,

while collaborator Guy Steele (who also provided the book's cartoons) published the original *Hacker's Dictionary* in 1983 based on the contents of the JARGON file he tended at MIT's Artificial Intelligence Lab. That dictionary recorded terms coined in the 1970s by the AI community. Now Raymond is co-keeper of "The File," and the two have stretched its scope to encompass the quips and queer usages for the more global hacker community.

The new dictionary's stated aim of covering "all the techni-

cal computing cultures wherein the true hacker-nature is manifested," means that PC hacking is just one of the many subcultures covered. Sure, there's a huge amount of code for the bitty box, but real hackers are not suits and code grinders who "implement payroll packages in RPG and other such unspeakable horrors." Instead, the true hacker nature is manifested in a programmer "who enjoys exploring the details of programmable systems and how to stretch their capabilities, as opposed to most who prefer to learn only the minimum necessary."

The *Dictionary's* 702 entries

TANDY

First with an entire line of
MPC computers, and available today
through Radio Shack...nationally!

IMAGINE

stunning graphics and animation, full digital-audio stereo sound, massive data accessibility: a new way of working and studying in a rich one-on-one interactive environment. Now stop imagining.

INTRODUCING TANDY® MULTIMEDIA COMPUTING

Tandy's complete new line of affordable multimedia computers is available today, ready to forever change the way you work and play.



Tandy has worked with industry leaders to produce the new Multimedia PC standard. Now, incredible amounts of data can be stored on a CD-ROM compact disc, ready for you to access software in a vibrant, enlightening way.

Come experience Tandy multimedia for yourself. Prepare to be swept away.



Radio Shack
AMERICA'S
TECHNOLOGY
STORE

MPC Logo/TM Multimedia PC Marketing Council, Inc. Inside Intel logo/TM Intel Corp

CIRCLE 289 ON READER SERVICE CARD

Read Only

are lively and entertaining, as well as the 70 pages of essays devoted to describing the hackish language and culture. With help from linguists, *The New Hacker's Dictionary* goes beyond the lexicon to analyze the hacker language and its evolution.

In examining how "hackerisms" are formed, Raymond and Steele cite a heavy reliance on the language of electronic communications. In many cases, a new word is a testimonial to a hacker's cleverness, which makes you wonder why more of them haven't turned to mainstream writing. The reason, of course, is that hackers aren't looking for accolades from mainstream society. "The Story of Mel, A Real Programmer," considered one of hackerdom's great heroic epics,

is included in the folklore section and pretty much says it all.

If you're still curious about any of the undefined hackerisms in this review, you're probably interested enough to buy this paperback. The alternative is to download The File through USENET, but probably only a true hacker would do that.

In *Technobabble*, another MIT

Press book, author John Barry explores the language of technology from another perspective, and chides the computer industry for its sloppy and inconsistent use of language. Every marketing claim, press release, magazine article, and advertisement is fair game in this account of the meaningless and incomprehensible chatter about technology.

Barry has set before him the daunting task of spell- and grammar-checking the computer industry's communications. He is



From the Mouths of Hackers

angry fruit salad: A bad visual-interface design that uses too many colors. This derives, of course, from the bizarre day-glo colors found in canned fruit salad.

machoflops: [pun on 'megaflops,' a coinage for 'mil-

lions of floating-point operations per second'] Refers to artificially-inflated performance figures often quoted by computer manufacturers. Real applications are lucky to get half the quoted speed.
—*The New Hacker's Dictionary* ■

not impressed with what he has found. And 14 years of exposure to the industry as a journalist puts him in a good position to make such an assessment.

Many of Barry's observations are humorous, especially if you know the companies, characters, and products involved. And his comments on how the industry's history and growth have affected the lexicon are often quite good.

But between these peaks are too many valleys. Barry has tried to tell us everything he knows about the subject without adequately organizing or editing it.

Technobabble tries to cover too much, and the result can fairly be called an extraneous "brain dump".—*Kellyn Betts* ■

The New Hacker's Dictionary

edited by Eric S. Raymond with Guy C. Steele, Jr., \$10.95.

ISBN: 0-262-68069-6.

Technobabble

by John A. Barry, \$22.50.

ISBN: 0-262-02333-4.

The MIT Press, 55 Hayward St., Cambridge, MA 02142; 617-625-8569.

CIRCLE 367 ON READER SERVICE CARD

Give Us Your Toughest Peripheral Sharing Problem

...or your simplest! Master Switch, the intelligent data switch from Rose Electronics, can handle it. The Master Switch series is so versatile and sophisticated, peripheral sharing becomes easy.

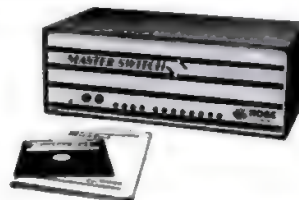
Anyone who appreciates ease-of-operation and technologically-advanced capabilities knows the Master Switch is the right choice...for sharing printers, plotters, modems, and any device with a serial or parallel port. Here's why:

- Any combination of serial or parallel ports
- Easy selection of peripherals
- User-expandable memory up to 4 megabytes
- Simultaneous access to all devices
- Rated 'fastest switch' by PC Magazine
- Advanced features include job queue, port contention, data collection, job control menu, initialization strings, pop-up menus, and many more
- Complete technical support; one-year warranty

The Low-Cost LAN Alternative

With our MasterNet software, the Master Switch provides many convenient LAN functions, such as E-mail, file transfer, and directory access.

Designed and manufactured in the USA. Field-proven in thousands of applications. The Master Switch answers any peripheral sharing challenge. Choose the intelligent data switch that handles your most complex needs, yet is easy to set up and operate... choose Master Switch.

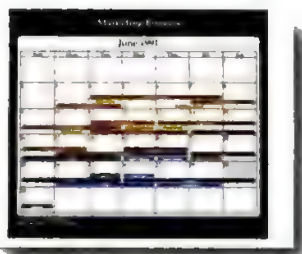


(800) 333-9343

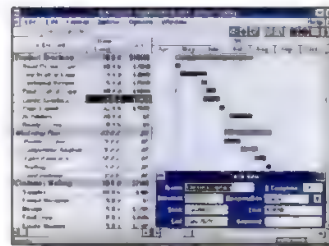
FAX (713) 933-0044 • (713) 933-7673
P.O. Box 742571 • Houston, Texas 77274
Call for complete information and our catalog of Switching and Sharing Solutions.
Dealer inquiries welcome.

Coming soon to a department under you.

NIGHT OF THE LIVING DEADLINES.



Project Calendar™ presents your schedules in a familiar calendar format—and that's just one of the many On Target reports.



On Target's graphical user interface, familiar spreadsheet format, and full color WYSIWYG graphics make project planning easy.

It's 2:30 a.m. Do you know where your projects stand? Now you can avoid those horrifying all-nighters with On Target™—the Windows 3.0 project planner from Symantec.

On Target is the easiest way to keep tabs on virtually all your projects at once. It's the most appropriate way, short of formal "project management," to manage all your schedules and deadlines.

On Target instantly converts your projects into a variety of detailed schedules, charts and graphs. Just enter your schedules into the familiar spreadsheet interface, and choose your own colors, fonts, and display format. On Target does all the rest.

On Target's *Schedule Assistant*™ guides you logically through the planning process. It even comes with *Starter Schedules*™ to help you start planning right away. So if your work load has become a nightmare, rest easy. It's all in a day's work with On Target.

Call 1-800-228-4122, Ext. 303P for a free demo disk* and competitive upgrade information.

CIRCLE 117 ON READER SERVICE CARD



SYMANTEC.

On Target creates a number of different reports. You can also copy graphics into other Windows applications.



With On Target, everyone is clear about their responsibilities—so your team can work together more effectively.

*Demo disk available in US and Canada only. Outside the U.S. call (408) 251-1600. © 1991 Symantec Corporation. On Target, Project Calendar and Schedule Assistant are trademarks of Symantec Corp. All other product or brand names used are trademarks or registered trademarks of their respective holders.

edited by
Trudy Neuhaus

Toolkits

Reviews of the Latest Tools for the PC Programmer

Custom Controls Add Pizzazz To Your Visual Basic Applications

One thing that makes Microsoft's Visual Basic a first-rate product is its extensibility. Not only can third-party vendors develop libraries of subroutines for Visual Basic, but they can also extend the toolbox with controls for building graphical front ends—controls that work as smoothly as those that are built-in.

Two of the first custom control sets are Desaware's \$48 Custom Control Factory (CCF) and Microhelp's \$129 VBTools. CCF adds just one control to Visual Basic's toolbox: a button that allows for spectacular animation effects and easy construction of multistate buttons, which change their appearance dynamically when you click on them or because of the state of an internal parameter.

VBTools has a potpourri of useful additions, with up to 11 new controls for extending Visual Basic's toolbox. It also comes with numerous add-on routines, including methods for making transitions from one bitmap to another with special effects such as rotations or explosions. Both products include a runtime DLL (about 100K each) that you may distribute with your own products without royalty payments.

CUSTOM CONTROL FACTORY

The value of CCF's single control lies in its many properties: Picture, Frame, PictureXpos, PictureYpos, PictDrawMode, Caption, TextPosition, Cycle, and OptionMode. Of these, Frame and Cycle are largely responsible for determining how a bitmap is displayed. The Frame property allows you to attach an array of

bitmaps (.BMP or .ICO files) to a control. The Cycle property controls the animation cycle, and differentiates among animated buttons, multistate buttons, and two-state animated buttons.

You select the display sequence of images by assigning any one of eight values to the Cycle property. For example, assign the Cycle property the value of 0, and when the button is selected, it will play all frames to the end; when the button is deselected, it will play all frames in reverse. Assign the Cycle property a value of 2, and when the button is selected, it will play all images in the array once with a programmable time delay between frames, and then return to the first frame when the button is deselected. This feature makes wondrous animation effects possible. And since the Cycle property is something you can change under program control, it, too, is extensible.

The Visual Basic manual describes a kludge involving hidden buttons to produce a multistate button. Using this, you could duplicate most of what CCF does, but it would be awkward, require repeating code each time you used it, and it would be much harder to maintain. So if multistate or animated buttons appeal to you, you'll want CCF.

VBTOOLS

Of VBTools' 11 custom controls, 6 are enhanced replacements for those in Visual Basic. For example, the Enhanced Text Box lets you set up masks of acceptable input and has an overstrike mode; the Tag List Box lets the user make multiple selections; and

the Enhanced Label has 3-D effects. The other 6 are new extensions for Visual Basic's toolbox.

VBTools' MhMulti custom control sets up multistate buttons. However, unlike CCF's multistate controls, MhMulti doesn't let you choose any bitmap you want; you are limited to the five built-in options.

The Gauge control lets you graphically display a numeric value on a thermometer or a dial-type gauge using a variety of supplied bitmaps or your own. The Keyboard State control lets you place buttons inside a window for keyboard toggles such as CapsLock; the user can then adjust these toggles with a mouse, visually displaying their On/Off status. An Alarm control lets you

VBTools

that is as slick as any of the card games in the *Windows Entertainment Pack*!

In addition to the 11 custom controls, VBTools includes nearly 100 functions and procedures. Some add QuickBASIC

keywords that Microsoft "forgot" to include in Visual Basic, such as CVC, MKCS, BLOAD, and PLAY. Others allow you to call Windows' API services like BitBlt and ExitWindows. Still others, such as MhFileExists, are samples from Microhelp's VB Muscle (\$180), a collection of low-level routines that should be released by the time you read this.

In short, VBTools is a solid collection of tools that can benefit any Visual Basic programmer.—Barry Simon ■



VBTools has 11 custom controls, including three alarms. Custom Control Factory lets you make buttons based on arrays of icons.

choose to display a telephone, wristwatch, or clock, and then rings an appropriate alarm.

Finally, there is the Playing Cards control requiring a 240K DLL you can distribute free of royalties. There are 13 built-in card backs, and you can change them, the suit, and card value under program control. With this control, all the graphical components of making a card game are taken care of for you. As an illustration, a blackjack game is supplied

Custom Control Factory, Version 1.0

List Price: \$48. **Requires:** Visual Basic, Windows 3.0. Desaware, 5 Town and Country Village, # 790, San Jose, CA 95128; 408-377-4770.

CIRCLE 695 ON READER SERVICE CARD

VBTools, Version 1.0

List Price: \$129. **Requires:** Visual Basic, Windows 3.0. Microhelp Inc., 4636 Huntridge Dr., Roswell, GA 30075; 800-922-3383.

CIRCLE 696 ON READER SERVICE CARD

We never dreamed for creating the best PC

Object-oriented, event-driven operation means that you get the benefits of a Graphic User Interface (GUI) on your DOS PCs, and code that's reusable from application to application.

FoxPro 2.0 is the state-of-the-database-art, an object-oriented, event-driven DBMS that runs in DOS to protect your information systems investments.

Rushmore query optimization is unique to FoxPro and gets your answers as much as hundreds of times faster than competitive products.

4GL Tools (Fourth Generation Language) simplify the creation of Mac-like applications on your DOS PCs, using keyboard shortcuts or a mouse.

Event-driven operation allows you to work with any number of resizable, scrollable windows, get to all of your data all of the time.

Optional Distribution Kit creates stand-alone .EXE files for distributing your applications.

Application Program Interface (API) links to external libraries written in C or assembler. Third-parties are currently developing communications, client/server access and other packages. (Optional Library Construction Kit available.)

Applications you write in FoxPro 2.0 can exchange data with our FoxBASE+/Mac on a LAN today, will run virtually unchanged under our Windows, Mac and UNIX versions currently in development (no release date yet).



For users, the View window makes it easy to work with multiple tables of data, RQBE (Relational Query By Example) simplifies the creation of business queries.

FoxPro 2.0 runs your industry-standard dBASE programs today, lets you build on your current systems for your needs tomorrow.

Response to FoxPro 2.0 has been overwhelmingly favorable.

And that's the problem: the response has been overwhelming:

We're hearing of callers being on hold for 20 minutes or longer!

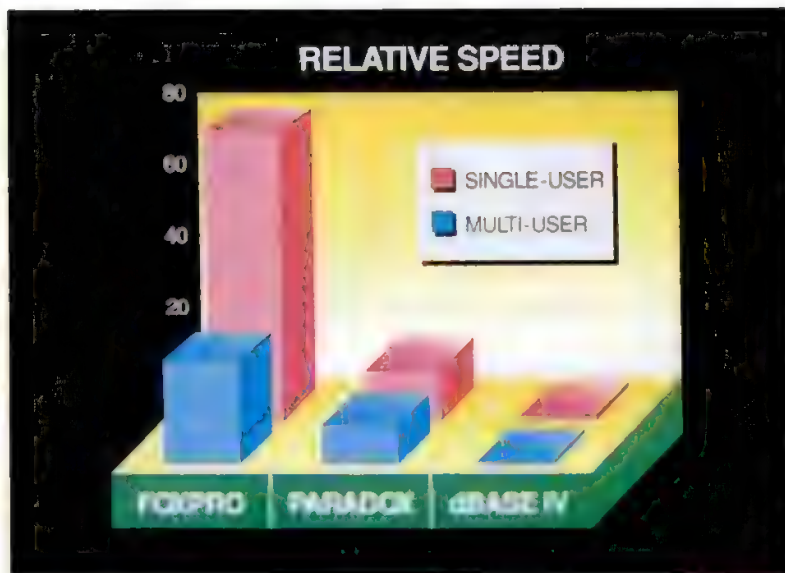
And this in spite of ramping up our support months in advance of the release.

Well, we're adding another 40 phone lines and hiring more people. And if that's not enough, we'll add even more.

In the meantime, we'd like to say

we'd be apologizing database in the world.

Results from an extensive suite of query tests independently performed by Micro Endeavors, Inc. and published in the 8/91 issue of Data Based Advisor.



FoxPro 2.0 is far faster than the other PC database management systems and raw compilers like Clipper, both single-user and on a LAN.

"Thanks" to the tens of thousands of you who put up with the wait, and "Sorry" to those who didn't.

But please try again. We think we've got things under control now.

And FoxPro 2.0 really is worth the wait.

Call 1-800-837-FOX2 or 419-874-0162 again.
(We believe we've fixed it.)



Query benchmark tests performed by Micro Endeavors, Inc. (215) 449-4680 FoxPro and FoxBASE+Mac are trademarks of Fox Holdings Inc., other products and services are not © Fox Holdings Inc. 1991

CIRCLE 112 ON READER SERVICE CARD

It's the tenth anniversary of the IBM PC. But you get all the presents.

Oh, we shouldn't have. But we did. Right now we're celebrating. And you will too when you see all the presents we have for you.

Cash back on powerful PS/2[®]s. Now you can get i386[™] SX power and more—up to \$200 back on the PS/2 Models 35 SX and 40 SX with the purchase of an IBM operating system.

Bonus software packages. Buy selected PS/2s and an IBM operating system, and you'll get \$775 worth of exciting, easy-to-use software that's great for your business. There's Quicken[®] Financial Pack for complete financial management. LotusWorks[®], with integrated spreadsheet, word processing, database and other capabilities. Express Publisher[™] for professional desktop publishing. And a voucher for the popular Turbo Tax[®], a preparation package for the 1991 tax year. Plus a special startup diskette that guides you through the installation and use of your new software.

Two operating systems. No charge.

When you buy the PS/2 Model 57 SX, we'll give you IBM DOS 5.0 at no extra charge, plus a voucher for a free copy of OS/2[®] 2.0. Coming out soon, OS/2 2.0 will be our most versatile operating system.

The best trade you ever made. Trade in selected computers from IBM, Apple[®] and Compaq[®] and you'll get credit toward the price of your new IBM PS/2. Help us celebrate. And take home the presents.

Now through December 31st, see your participating IBM Business Partner. For the one nearest you, call 1 800 942-4-IBM.



IBM DOS or OS/2 operating systems only. Bonus application software requires 640 KB memory and a fixed disk drive. Express Publisher requires IBM or IBM-compatible mouse. Offer valid in USA only while supplies last. Software value based on M.S.R.P. See your IBM Authorized Business Partner for details. IBM OS/2 and PS/2 are registered trademarks of International Business Machines Corporation. Charles Chaplin © Bubbles, Inc. S.A. 1991 represented by Bliss House, Inc. Springfield, MA 01103. The trademarks are owned as follows: Quicken, Intuit Inc.; LotusWorks, Lotus Development Corporation; TurboTax, Chipsoft Inc.; Express Publisher, Power Up! Software Corporation; 386, Intel Corporation; Compaq, Compaq Computer Corporation; Apple, Apple Computer Corporation. © 1991 IBM Corp.

IBM

Michael J. Miller



The Merging Of Windows Word Processors

In their first major overhauls, *Ami Pro* and *Word for Windows* have moved much closer together in look and feel. Can you still tell them apart?

It's amazing what a little customer feedback can do for software developers, particularly in the *Windows* market. Programs that have been around for a few versions are typically better. It's been nothing short of remarkable to see what a difference a new version can make with old-timers such as *Excel* and *PageMaker*.

Now we're seeing the first major overhauls of *Windows*-based word processors since the market began two years ago. Lotus has already released *Ami Pro* 2.0, and Microsoft is finishing *Word for Windows* 2.0 as I finish this column. As you would expect, the programs have moved forward in the features war; both

now support programmable icons and OLE. More impressively, each is considerably easier to use than its predecessor.

The original *Ami Pro* had the competitive edge with its layout tools—frames could hold charts, pictures, or text—and with its built-in chart-

ing and drawing. *Word for Windows*' strong suit was ease of use, largely due to a "ribbon bar" that displayed style and formatting choices. *WinWord* also had an integrated outliner and could open multiple documents at once.

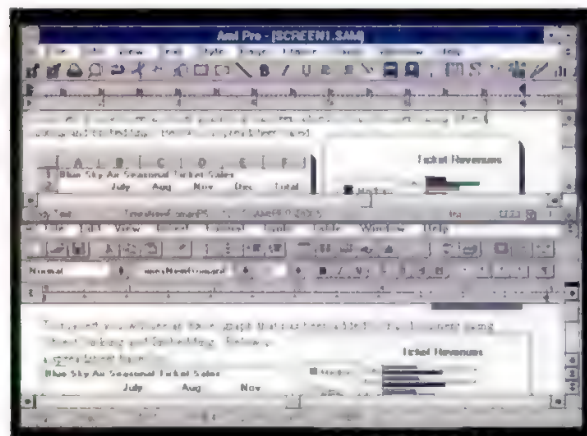
In their new versions, the products have moved much closer together in features. *Ami Pro* 2.0 adds an outline view that lets you control the level of viewable outline detail. It has better indexing, a better way of showing revisions, and finally supports multiple documents open at once.

Ami Pro always had powerful control over fonts, spacing, and alignment, but it wasn't always easy to see what style you'd chosen or how to get the style you wanted. That has all changed. Version 2.0 adds a "status bar" that tells you all this. You can now define a style or adjust tabs, margins, columns, and indents easily from a ruler within each document window—not from a dialog box. None of

these are new ideas; they all existed, in some form or other, in *WinWord*.

Microsoft hasn't stayed in an ivory tower, either. *Ami Pro*'s earlier version had the edge in layout flexibility and complex documents, largely due to its frame metaphor. Now, *WinWord* is playing catch-up. You can create a frame by selecting text or by choosing either an insert frame command or icon and drawing the frame into your document. Then you can modify the frame to set precise positioning. *WinWord* has also added a traditional drawing tool and charting tool resembling *Excel*'s.

Both programs move ahead in ease of use by adding icons for typical operations—saving a file, printing, and spell-checking—all at the click of a button. *Ami Pro* adds the "SmartIcons" that Lotus introduced in 1-2-3 for *Windows*. SmartIcons can be positioned anywhere you want on-screen, and you can customize them to include both prebuilt functions and macros of your own. If you're unsure what an icon does, click on it with the right button and a descriptive line of text appears. *WinWord* also adds a "toolbar" with icons, but you cannot move the icon bar from the top of the window. You can customize specific icons,



Separated at birth: This view of *Ami Pro* 2.0 (top) and the soon-to-be-released *Word for Windows* 2.0 (bottom) show how similar their interfaces are.

but you don't get as much help as in *Ami*.

WinWord and *Ami Pro* now connect to other applications via object linking and embedding. OLE lets you place an "object" in a word processing document, such as a spread-

Michael J. Miller

sheet or graph, then double-click on it to edit the object in its original program. OLE is a wonderful idea, but it's still somewhat confusing. In either program, it works slightly differently depending on whether you insert an object directly from within the word processor or whether you

"paste link" it from a running application. Often the screen display isn't what you expect. In *Ami Pro*, you see the imported spreadsheet complete with row and column headers; in *Word for Windows*, you see only the data. Before most users become comfortable with OLE we'll need some better standards.

To see how object linking should work, take a look at *Ami Pro*'s internal drawing tool. Click on a drawing in your docu-

ment, and you get new icons for drawing. This lets you work as though you have a single document with multiple sets of tools. It should always be this easy.

On the features front, *WinWord*'s major move is the inclusion of the Houghton Mifflin *CorrectText* grammar-checker. *Ami Pro* counters with a coupon for Reference Software's *Grammatik*. It looks as if grammar-checkers are now must-have features in a word processor. One problem though: I still haven't seen one that is both accurate and simple to use.

VIVE LA DIFFERENCE

While they've grown closer, there are still some glaring differences. For instance, *Ami Pro* still offers more options in creating a frame. You can easily draw a frame by hand or create precise frames by entering specific dimensions and location, which is better than Microsoft's two-step process. *Ami*'s drawing tools go a bit further as well, with a new Bezier curve tool, an extensive clip-art library, a powerful equation editor, and an icon-based table builder. Finally, *Ami*'s macro language is dramatically improved; you can attach macros to fields in your document.

WinWord remains the most customizable application I've ever seen. You can move or rename menu commands, change icons, and even change keyboard shortcut commands. It works better from a keyboard and installs in much less hard disk space, making it more suited for a laptop. And for people just moving to *Windows*, it lets you operate the program with *WordPerfect* keystrokes.

I was pleasantly surprised with all of the new options *WinWord* gives you for cutting, copying, and pasting text. You can now use a new set of keystrokes following the Macintosh convention. For *Windows* users that might be heresy, but for those of us who also use Macs, it's wonderful. The new "drag and drop" convention is another inspired feature. You can move highlighted text with your mouse in the same way you move frames, without going through the Clipboard.

Many of the things that distinguished these programs from each other in the past are gone. They are pulling closer together in their feature sets and in the most obvious aspects of their user interfaces. Maybe over the next few years, we'll see other software vendors concentrating more on the little details that make a program intuitive. If so, the next generation of software might be a big leap forward. ■

She's 5 years old.
She's already had 7 names,
16 identities and
21 homes.

Every year thousands of children are kidnapped by their own parents. Beginning the tragic ordeal of life on the run.

Child Find offers an end to the running. With our toll-free number and our mediation program, we offer a way out for the parents and for the kids.

For us, it's a labor of love. But unfortunately, we can't operate on love alone.

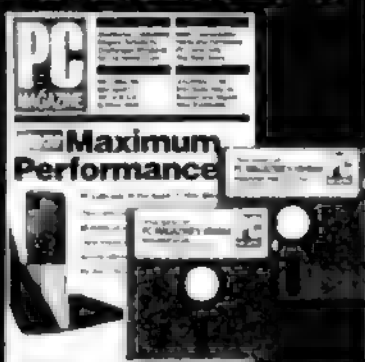
To find out how you can help, or if you need our help, please call 1-800-A-WAY-OUT. And help another child find a more peaceful future.



CHILD FIND OF AMERICA INC.



GET NONSTOP
SYSTEMS
INFORMATION
— AND 2 DISKS
FREE!



PC MAGAZINE is the one publication you can trust to keep you up-to-date on the latest developments in the ever-changing world of computing.

Subscribe now to make sure you don't miss a single product report or productivity-enhancing tip.

- One year (22 issues) for \$29.97. **SAVE 54%.**
- Two years (44 issues) for \$49.97. **SAVE 62%.**

And if you order now, you'll also get our exclusive 2-DISK "BEST OF PC MAGAZINE'S UTILITIES"—FREE with your paid subscription!

Don't delay. Call toll-free today to claim your savings and FREE "BEST OF PC MAGAZINE'S UTILITIES!"

1-800-289-0429

Please add \$32 per year for postage outside the U.S., U.S. currency only. Canadian GST included. Please allow 30 days for delivery. Disks will be shipped upon payment.

The perfect performance.

\$399



The Jumbo 120.

SCOREBOARD	
Attribute	Colorado Memory Systems' Jumbo Tape Backup
Reliability of backup process	10
Integrity of backup process	10
Speed of data backup	10
Quality of documentation	10
Weighted Score	10

PC WEEK August 14, 1989

The encore.

\$499



Introducing the Jumbo 250.

The Jumbo 120 tape backup system scored a perfect 10 in a PC Week poll. Our new Jumbo, the 250, has the capability to store twice as much of your valuable data at twice the speed. Typically 250 megabytes, with data compression. Which begs the question - is there such a thing as more than perfect?

Check out the new Jumbo 250, and the Jumbo 120. Both feature unprecedented reliability, easy installation, unattended backup, data compression, Novell® certification, UNIX®/Xenix® support and QIC compatibility.

For more information, call 1-800-346-9881, fax (303) 667-0921, or write 800 S. Taft, Loveland, CO 80537.



**COLORADO
MEMORY SYSTEMS INC.**
Perfect keeps getting better.

STACKER™
SOFTWARE
DOUBLES
YOUR DISK
CAPACITY.



1991
WINNER
PC Magazine Award
for Technical Excellence



Stacker 1.1
Stac Electronics

Used to be, when your hard disk got full you had to empty your wallet and buy a bigger one.

Or, you could buy yourself some time by deleting a bunch of your files.

At Stac, we didn't think this was much of a choice. So we invented Stacker.

In the process, we created an instant bestseller. Which isn't surprising, considering that Stacker instantly gives you twice the disk capacity you had before.

You see, Stacker is fast. So fast, in fact, that it actually improves the performance of many of your applications.

Stacker is also 100% safe—something no other data compression product on the market can say.

Which explains why every leading utility software publisher and tape drive manufacturer uses our technology in their own products.

Speaking of software publishing and hardware manufacturing, we do both.

Which means we give you a choice.

If your PC can't spare a slot, or if your PC is a portable, a laptop or a notebook, the software on the opposite page is just what you need.

But if you're one of those

who insist on smaller driver size and the highest possible speed and compression ratio, you'll want to install one of our three hardware versions.

Installation, by the way, is a snap. Just plug the board into any slot—no jumpers or switches to set.

The software practically installs itself. It even optimizes your disk for you.



In addition to the software-only version, Stacker is now available in three co-processor-with-software versions: Stacker XT/8, Stacker AT/16 and Stacker MC/16, each featuring the unique Stacker LZS chip.

To find just how much Stacker can do for your disk, your data and your wallet, call 1-800-522-7822 Ext. 726. Or ask your dealer for a demonstration.

And see how well we Stac up.

STAC

The Data Compression Company

Now, aren't you glad you didn't rush out and buy a new hard disk?

How?

By compressing all the files on your disk—applications, utilities, documents, spreadsheets, data, everything—using our patented Stacker LZS data compression technology.

Don't know a thing about data compression?

Don't worry. You don't have to.

In fact, you don't have to think about Stacker at all.

Stacker works behind the scenes, expanding your data when you need it and compressing it again as it goes back to disk. Automatically.

It doesn't even matter what kind of software you use. Because Stacker is 100% compatible with everything from business and graphics programs to undelete utilities and low-level formatters.

Not to mention the latest versions of DOS[®] and Windows.[®]

If you think doubling your disk capacity will slow you down, think again.



As data is stored on your disk, Stacker instantly compresses it. Then, when your PC reads the data, Stacker instantly expands it. You don't have to do a thing.

Introducing the first 486SX laptop computer that comes in 256 colors.



The new ProSpeed® 486SX/C laptop is a breakthrough made possible only by NEC's mastery of active matrix color display technology: the first 486SX laptop computer with a TFT screen capable of displaying 256 colors at 640 x 480 resolution.

The result: some of the most brilliant, photographic-quality images you've ever seen on any computer screen, laptop or otherwise. It also puts on an equally spectacular display of power, thanks to an Intel® 486SX™ microprocessor running at 20MHz, a 120 or 200MB hard drive, and the first 32-bit EISA bus to be found on any laptop. Add to that its full-size keyboard, and a full complement of ports, and you have the perfect solution for any application requiring massive amounts of power—from software demonstrations to sales presentations, complex graphs and diagrams to CAD-CAM, and beyond.

*NEC is a world leader
in virtually every category
of imaging technology:
from the brilliant
displays on our laptops,
to our MultiSync®
monitors, color thermal
printers, CD-ROM
readers and more.*

ProSpeed is a registered trademark of NEC Home Electronics Ltd. and MultiSync is a registered trademark of NEC Technologies, Inc. intel is a registered trademark and 486SX is a trademark of intel Corp. © 1989 NEC Technologies, Inc.

Because  is the way you want to go.

NEC

CC
Computers and Communications

For more information, call 1-800-NEC-INFO.

CIRCLE 157 ON READER SERVICE CARD

Bill Machrone



The Gospel, According To Intel

Intel's revisionist views of the market and its own actions are informative and entertaining.

History is always fascinating. Especially when you can rewrite it. And that's exactly what Intel has done.

To understand Intel's behavior, you have to understand cats. Cats are enormously competent, if somewhat overspecialized creatures, and they seldom mess up. But with competence-going-on-perfection comes aloofness and a sense of rightness of purpose that borders on compulsion. I once saw a cat run from a carpeted floor to a highly polished kitchen floor, lose it, and crash into the table. It then proceeded to examine the table carefully, sniffing each leg, as if it had all been part of the plan.

Catch a cat in the act of doing something dumb, and it'll look brazenly back at you, as if to say, "I meant to do that."

Intel has had some very catlike moments in the market lately. Its feats of agility, however, stretch my credu-

lity. For example, Intel maintains that there is no such thing as a 386. There's a 386SX and a 386DX, and the only difference between them is price, not external bus width. Funny. I remember when the 80386 first shipped—without any suffixes. It was a 32-bit chip, period. When Intel introduced the 386SX, it was back in the days when fast memory was expensive. The SX gave you 32-bit computing with inexpensive 16-bit memory. The letters SX were derived from the word sixteen.

As Bob Haldemann once said, that statement is no longer operative.

After spending millions on its "spray paint" ad campaign (which, if you recall, was devoted to eradicating the noxious 286), Intel decided that the message it had gotten across was that SX equals cheap, not sixteen. Parallel to that, of course, was the emergence of the 80486 and the virtual certainty that AMD would produce a workalike 386. As an interesting side note, Intel emphatically rejects the term "clone" for other 386s. The correct Intel-ese is "imitator." There's probably some good legal reason for this, but more important is Intel's notion that no one else could really duplicate one of their chips function-for-function.

Intel's resolve also ties in with the company's current "Intel Inside" campaign, in which we are to believe that it is really important that the CPU inside be manufactured by Intel. Apparently the manufacturer of a product is more important than its technical attributes. This notion of "branding," by the way, is exactly what has stopped working in the consumer products market. With AMD, Chips and Technologies, NexGen, and others in the 386-compatible market, Intel is a monopolist facing competition for the first time. So you can bet that it will be pushing the "Intel Inside" message even harder. Heck, if the company really believes in making Intel a household name, it needs an appropriate spokesperson, one who would wear the new slogan proudly. Like maybe Madonna.

YEAH, RIGHT

Then we add the 80486. This 1.2 million-transistor device is a marvel of semiconductor engineering. When Intel introduced it, the 486 was the high-priced alternative to a 386 and a 387 math coprocessor. It was targeted at the high end, because it could execute floating-point instructions three times as fast as the



387. Never mind that much of the speed increase came from taking away inherent delays that were inadvertently designed into the interface between the 386 and 387, faster is faster. The 486 also executes 32-bit instructions significantly faster than the 386 does, a benefit that's lost on most of us, who are still hopelessly mired in 16-bit system and applications code.

486 prices have come down, but not enough to forestall the encroachment of the 386 clones

Hassle-Free Printer Sharing

Now...ServerJet™ Technology for Any Printer!



You loved the features and compact size of our popular *ServerJet*, PC Magazine's "favorite solution for sharing LaserJets." But you need a solution that will work with any laser, dot matrix or other standard parallel printer.

It's called the *JetWay*™.

Stretch up to hundreds of feet of telephone-type cable from your PCs to the *JetWay*. Plug your printer cable into the *JetWay* and plug in the power cord. If you're tight for desktop work space, just slap the video cassette-sized *JetWay* onto the side of your printer.

Then, up to eight people can simultaneously *whoooooosh* documents to a printer at the "jet speed" of 115,200 baud – for less than \$69 per user.

It's that easy. Here at ASP, we call it "hassle-free." We use it as an ingredient in all of our products.

No more wandering down the hall with diskette in hand.

Or borrowing someone else's printer.

Or wasting time waiting to print.

The *JetWay* is available in a variety of models with up to 4MB of buffer memory to spool your print jobs.

Take off with a *JetWay* and watch your productivity soar!

To order your *JetWay*, or for a **FREE** catalog of our full line of printer-sharing solutions, call ASP at:

800-445-6190

International 408-746-2965

ASP
ASP COMPUTER PRODUCTS, INC.

160 San Gabriel Drive, Sunnyvale, CA 94086, USA
Telephone: 408-746-2965 • Facsimile: 408-746-2803

JetWay and ServerJet are trademarks of ASP Computer Products, Inc. LaserJet is a registered trademark of Hewlett-Packard Co.

CIRCLE 111 ON READER SERVICE CARD

Bill Machrone

(imitators?) at the low end. So Intel introduced the 486SX, which has 32-bit addressing but no math coprocessor. The early 486SX chips are essentially 486s in which the math portion didn't work. So Intel priced them at about half the cost of a 486, neatly paving the way for the current crop of sub-\$3,000 486SX machines. But now Intel tells us that the 386 was never the target, that the real goal was to fend off massive encroachment by workstations. I can just see you going through your decision process: "Lessee now, what should I get? Dell, Gateway, Sun, Compaq, RS6000?" Boy, that 486SX is sure keeping those workstations from invading our market, all right.

The biggest joke, of course, is the 487SX. Intel has been insistent that manufacturers include the socket for the 487SX, just in case the users want a math coprocessor. The 486SX/487SX strategy, as you know, has been widely greeted with hoots of derision. So Intel will introduce the double-speed 486 chip (it runs twice as fast internally) for that second socket early next year, claiming that was its plan all along.

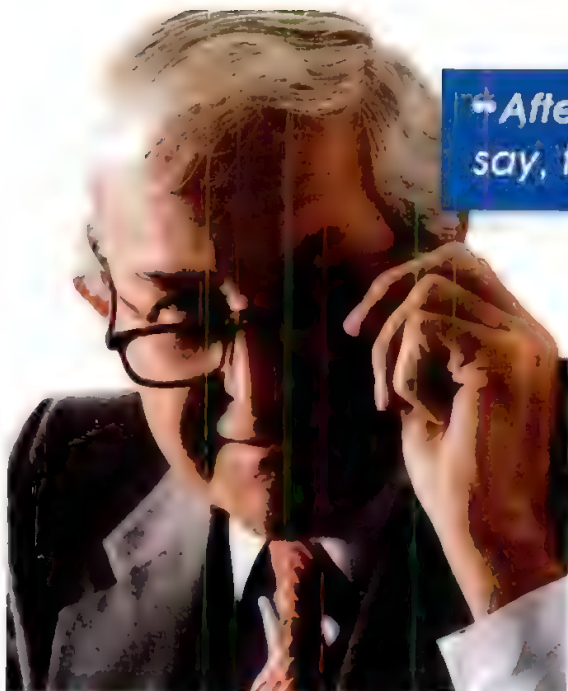
A PLETHORA OF CONSORTIA

Now we come to the new crop of strategic alliances and new technologies: Solaris. Apple/IBM. ACE. Solaris is Sun's operating system, all gussied up to run on Intel-platform machines. Intel says it's wonderful. I say it's bait-and-switch. Sun, after all, is a hardware company.

The Apple/IBM alliance is, to my way of thinking, those companies stating their considered opinion that Microsoft and Intel have gotten too big for their britches. Keep in mind, though, that IBM is Intel's largest customer, so they've got to play this one carefully. So Intel tells us that this initiative to literally reinvent the personal computer will be a boon to Intel, because some of the software will run on their CPUs.

The quintessential ACE machine has a mips RISC processor, Unix, a Silicon Graphics video section, and an EISA bus. Yet somehow Intel says that this is terrific news.

Frankly, I don't think the people at Intel have much to worry about. Besides, if they don't like the way the future turns out, they can always revise it. ■



"After reading what all the experts had to say, the choice was obvious... Acma."

The Experts Give Acma Rave Reviews For Quality, Performance, Service And Value!

Today's leading experts consistently rank Acma among the best! Simply stated, at Acma, we build quality products that provide top performance and tremendous value. And we stand behind our computers with FREE on-site service, a 45-day money-back guarantee, a full one year warranty, and lifetime Toll-Free technical support. We even load DOS 5.0 and Windows 3.0 for you. It all adds up! All this and guaranteed satisfaction make Acma an excellent choice – and the experts agree!

"THE PERFECT WINDOWS 3.0 WORKSTATION."



"...OUR FAVORITE IS THE ACMA 386/25."



"A SOLID VALUE FOR YOUR DOLLAR."



"THE ACMA IS A PRINCE AMONG PEERS."



Acma Gives You All These Features & Services...

- ▼ 45-Day Money-Back Guarantee*
- ▼ One-Year Parts & Labor Warranty (Many Components Covered By Two Year Manufacturer's Warranties)
- ▼ **FREE** One Year TRW On-Site Service (Available In Most U.S. Locations)
- ▼ **FREE** Lifetime Toll-Free Technical Support
- ▼ **NEW!** Tech-Support Now Open Mon.-Sat.
- ▼ **SPECIAL!** \$1.00 Upgrade Program
- ▼ **NOW AVAILABLE!** 1.2GB Hard Drives!
- ▼ **FREE** Return Shipping, Of Replacement Or Repaired Parts.*
- ▼ **NOW AVAILABLE!** Programmable Keyboards!
- ▼ Fast Delivery!
- ▼ 48 Hour High-Temperature Burn-In
- ▼ DOS 5.0 & Windows 3.0** Preloaded
- ▼ Custom System Configurations
- ▼ Personal & Business Leasing Plans
- ▼ Credit Cards **Not** Charged Until Shipment
- ▼ Special GSA (& Quantity) Discounts

Special \$1.00 Upgrades!

800-456-1818

Sales: 6am-7pm M-F & 8am-4pm Sat. (PST)
Tech-Support: 7am-6pm M-F & 8am-4pm Sat. (PST)
International 510-623-1212, 24-Hr. Fax 510-623-0616

COMPUTERS, INC.
Acma

Call For
GSA
Pricing!

Standard System Specifications...

- ▼ 4MB RAM
- ▼ 1.2MB & 1.44MB floppy disk drives
- ▼ Hard disk drives (see below)
- ▼ 16-bit VGA card with 1MB RAM
- ▼ 14" Non-Interlaced Super VGA monitor (1024x768, .28 dot pitch)
- ▼ 101-key enhanced keyboard
- ▼ 2 serial, 1 parallel & 1 game port
- ▼ Windows 3.0** (loaded) & Mouse
- ▼ MS-DOS 5.0 (except notebook)
- ▼ Call for custom configurations, peripherals, and \$1.00 upgrades!

Notebook SX/20MHz: 1MB RAM, 40MB/HDD, VGA Display	\$1,795
386SX/20: 52MB IDE/HD	BEST BUY AWARD! \$1,595
386/25: 105MB IDE/HDD	\$1,795
386/33: 105MB IDE/HDD, 64K Cache	BEST BUY AWARD! \$1,995
386/40: 105MB IDE/HDD, 64K Cache	\$2,095
486/33: 210MB IDE/HDD, 64K Cache	BEST BUY AWARD! \$2,695
486/33 EISA: 210MB IDE/HDD, 256K Cache	\$3,495

YES! Send me FREE reprints of what the experts are saying about Acma!

Name _____

Address _____

City _____

State/Zip _____

Phone (____) _____

Please send me reprints for:

- ☐ 386/SX ☐ 486 ISA
☐ 386/DX ☐ 486 EISA



CAD1191

CIRCLE 360 ON READER SERVICE CARD

© Acma Computers Inc. 48501 Warm Springs Blvd. Fremont, CA 94559 (510) 623-1212, (510) 623-0616 Fax. Purchase orders are subject to approval. No surcharge on Visa or Mastercard. Credit cards are not charged until the order is shipped. All prices and specifications are subject to change without notice. *The 100% satisfaction/45-Day Money-Back guarantee covers Acma brand computers only (software, printers, monitors, and shipping are not included). **Windows 3.0 is not included with notebook PCs. *Customer pays shipping to Acma for parts replacement or repair and Acma pays return shipping (call for complete details).



ZEOS 386SX

**The Incredible ZEOS 386SX-20!
2MB 53ns RAM, 85MB Drive,
VGA Color, Lotus 1-2-3 for
Windows, Ami Pro 2.0 and more!
ONLY \$1995.**

It's what everyone wants. Our new 386SX using the latest high-speed memory for true 20MHz Zero Wait-State performance. Loaded with features and ready to ship to you today!

- '386SX-20 CPU, 8/20MHz.
- 2MB of Zero-Wait 53ns DRAM, expandable to a System Total of 16MB on the mother-board.
- 85MB High Speed IDE Hard Drive.
- 1.2MB and 1.44MB Teac® floppies.
- ZEOS 14" High Res 1024x768 VGA Color Monitor with Tilt/Swivel base.
- High Speed 16-bit Diamond SpeedStar Plus VGA 1024 color graphics card with 1MB RAM!
- Lotus 1-2-3 for Windows, *plus* Ami Pro 2.0, *plus* Microsoft Windows and DOS 5.0, *plus* a genuine Microsoft mouse!
- Shadow RAM and EMS support for enhanced performance.
- ZEOS/RS 101 key SpaceSaver keyboard.
- High Speed ZEOS I/O with two Serial, one Parallel & one Game Port on the mother-board.
- 7-16, 1-8 bit expansion slots. 80387SX math coprocessor support.
- Rugged ZEOS SpaceSaver case with two cooling fans for added reliability and product life.
- Seven drive bays and our custom 200 Watt power supply for your future expansion!
- Includes ZEOS 24 Hour a Day Toll Free Technical Support and Customer Satisfaction package.

Computers Now! SM



RIGHT NOW. GUARANTEED!*

Yes, we can ship your new ZEOS '386 or '486 today! We've built up an extra supply of the hottest selling computers in America—the ZEOS 386SX-20 *plus* the ultra-fast ZEOS 386DX-33 and 486-33MHz thunderbolts. Hot systems *ready now!*

Take your pick! All three of these Color VGA screamers come packing a high capacity high speed hard drive, tons of memory, two floppies *plus* all the other goodies. And they're ready to ship. *Right Now!*

Here's how it works. We have these incredible ZEOS '386 and '486 Color VGA systems pre-built and ready to ship. While supplies last, we will ship any of these systems to you *the day you order* subject to these conditions:

1. Your order must be received by 1PM Central Time.
2. Credit Cards are subject to authorization.
3. Orders must be for ZEOS '386 or '486 systems configured as shown here. Any other systems or upgrades are custom built and will take slightly longer.

***OUR GUARANTEE TO YOU:**

If we accept your order for immediate shipment and fail to ship your system under the conditions outlined, we will ship it at *our expense* as soon as it is ready.

This offer is good only as long as these pre-built systems remain in stock; please give us a call to verify availability. This offer does not apply to other ZEOS systems or custom configurations.

IMMEDIATE SHIPMENT IS ONLY PART OF THE STORY.

These are not just any computer systems. They're high performance, high quality ZEOS systems. Packing all the ZEOS value that has won PC Magazine Editor's Choice—*eight times!*

But the real winner is you! Compare price, performance, quality and features. You'll see why PC Magazine selected ZEOS '386 systems "For Overall Excellence" above all others. But don't stop there.

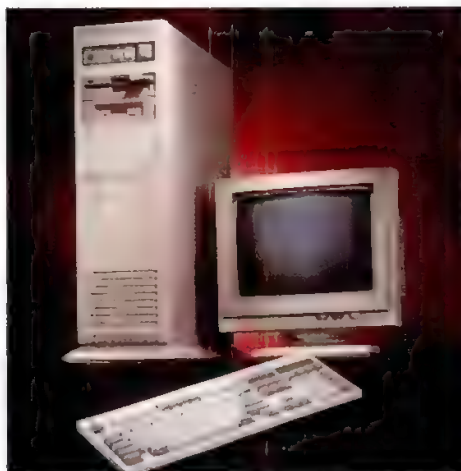
How about *24 Hour A Day Toll Free Technical Support*. It was ZEOS who invented 24 Hour a Day Toll Free Support (it's an idea others have since copied but haven't matched). Add to it our 30 Day Absolute Satisfaction Money Back Guarantee, One Full Year Limited Warranty, Express Replacement Parts Policy and Customer Satisfaction Package. You'll love it all. Almost as much as your new system.

So give us a call right now. If we hear from you by 1:00 this afternoon, we'll get your new system on the way to you today! Call now Toll Free 800-423-5891.

Purchase orders from Fortune 1000 companies, Governments and institutions subject to approval. Leasing programs available. All prices and specifications subject to change without notice. Please call to confirm pricing, specification and warranty details. The following are trademarks of their respective corporations: Microsoft, MS-DOS and Windows of Microsoft Corporation; Lotus, 1-2-3 & Ami Pro of Lotus Development Corporation; ZEOS, Computers Now!, SpaceSaver, SuperCase and Z-Card of ZEOS International Ltd., © ZEOS International Ltd., 530 5th Avenue, N.W., St. Paul, MN 55112 USA. ZEOS is a publicly traded company, NASDAQ symbol: ZEOS



ZEOS 386-33 or ZEOS 486-33



Optional ZEOS Vertical Case

**The 33MHz ZEOS '386! 128K Cache, 4MB RAM, 130MB HDD, VGA Color, Lotus 1-2-3 & Ami Pro for Windows!
ONLY \$2795.**

Power packed and ready to go! Order it UPS Red and this 33MHz Racer can be on your desk tomorrow!

- Upgradable '386-33 CPU, 8/33MHz Dual Speed Keyboard Selectable.
- Ultra high speed Zero-Wait 128K SRAM Cache.
- 4MB of High Speed 53ns DRAM, expandable to a System Total of 32MB on the motherboard.
- Ultra Fast 130MB IDE Hard Drive.
- 1.2MB and 1.44MB Teac® floppy drives.
- ZEOS 14" High Res 1024x768 VGA Color Monitor with Tilt/Swivel base.
- High Speed 16-bit Diamond SpeedStar Plus VGA 1024 color graphics card with 1MB RAM!
- Lotus 1-2-3 for Windows, *plus* Ami Pro 2.0, *plus* Microsoft Windows and DOS 5.0, *plus* a genuine Microsoft mouse!
- Shadow RAM and EMS support for enhanced performance.
- ZEOS/RS 101 key SpaceSaver keyboard.
- High Speed ZEOS I/O with two Serial, one Parallel & one Game Port built onto the motherboard.
- 7-16 and 1-8 bit expansion slots. 80387 math coprocessor support.
- Rugged ZEOS SpaceSaver case with two cooling fans for added reliability and product life.
- Seven drive bays and our custom 300 Watt power supply for your future expansion.
- Includes ZEOS 24 Hour a Day Toll Free Technical Support and Customer Satisfaction package.

**Loaded ZEOS '486-33MHz Screamer. 128K Cache, 4MB RAM, 130MB drive, VGA Color & Full Lotus bundle!
ONLY \$3095.**

From a family of eight *PC Magazine* Editor's Choice computer systems. Your 33MHz '486 Screamer in our 7-bay desktop case.

- Modular '486-33 CPU, 8/33MHz Dual Speed Keyboard Selectable.
- Ultra high speed Zero-Wait 128K SRAM TurboCache.
- 4MB of Zero-Wait DRAM, expandable to a whopping 32MB on the motherboard.
- 130MB High Speed IDE Hard Drive.
- 1.2MB and 1.44MB Teac® floppy drives.
- ZEOS 14" High Res 1024x768 VGA Color Monitor with Tilt/Swivel base.
- High Speed 16-bit Diamond SpeedStar Plus VGA 1024 color graphics card with 1MB RAM!
- Lotus 1-2-3 for Windows, *plus* Ami Pro 2.0, *plus* Microsoft Windows and DOS 5.0, *plus* a genuine Microsoft mouse!
- Shadow RAM and EMS support for enhanced performance.
- ZEOS/RS 101 key SpaceSaver keyboard.
- High Speed ZEOS I/O with two Serial, one Parallel & one Game Port built onto the motherboard.
- 7-16 and 1-8 bit expansion slots. 80387 math coprocessor support.
- Rugged ZEOS SpaceSaver case with two cooling fans for added reliability and product life.
- Seven drive bays and our custom 300 Watt power supply for your future expansion.
- Includes ZEOS 24 Hour a Day Toll Free Technical Support and Customer Satisfaction package.

ZEOS. Fast Delivery, Great Systems! A Few Expert Opinions:

■ **PC Magazine, On the ZEOS 386SX, "With so much going for it, how could you go wrong?"**

■ **PC Magazine, On ZEOS '386 systems, "Out of 104 Machines... For Overall Excellence we selected ZEOS International..."**

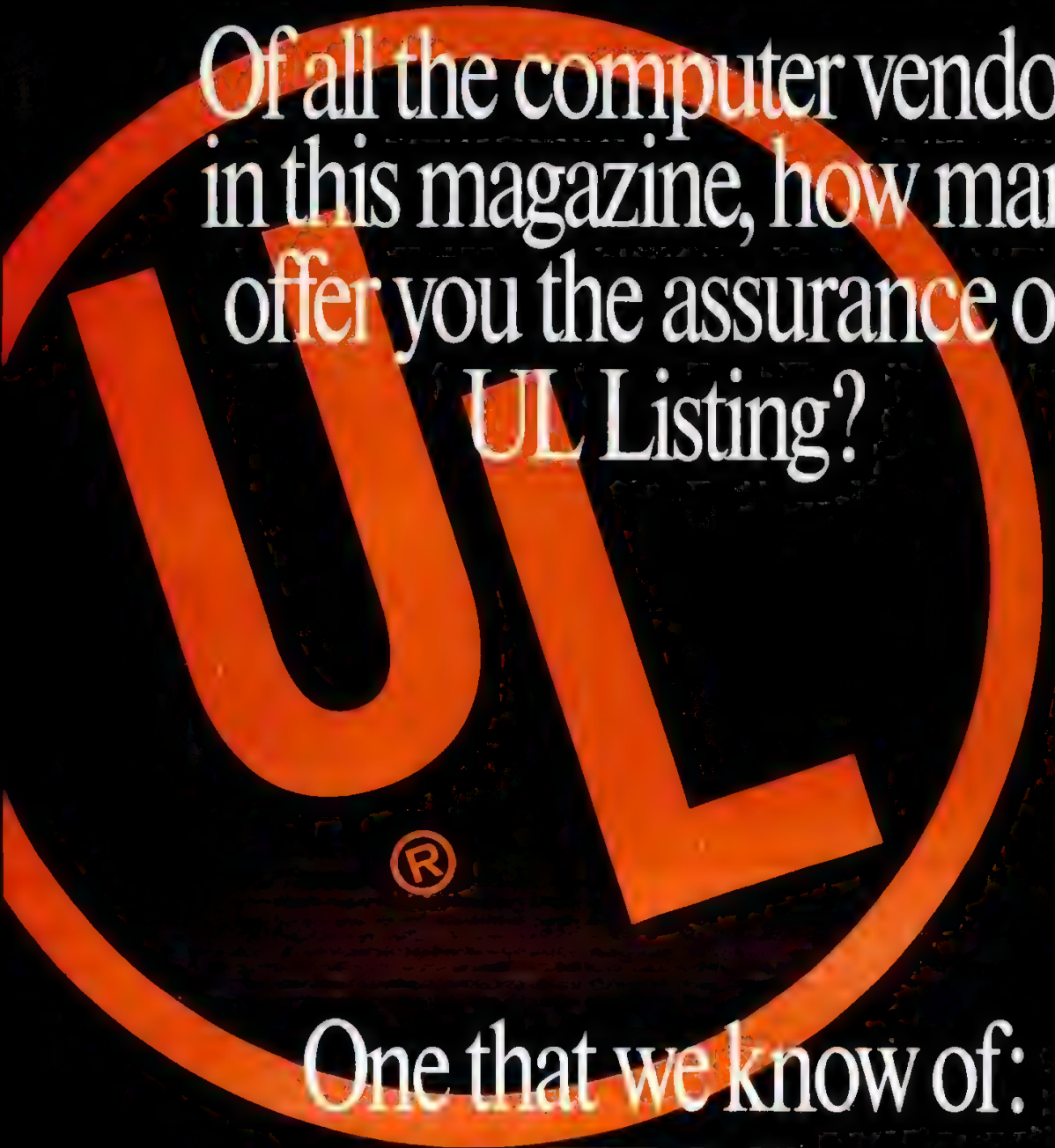
■ **PC Magazine, On Zeos '386 Speed, "The ZEOS blows away every other computer... a smart choice."**

Now includes Lotus 1-2-3 for Windows and Ami Pro 2.0!

**ORDER NOW TOLL FREE
800-423-5891**

**FAX Orders: 612-633-1325
Minnesota: 612-633-4591
Hearing Impaired (TDD)
Orders: 800-228-5389
Outside US and Canada:
612-633-6131
MasterCard, VISA,
Discover, Am Exp, Z-Card
and COD.
Open 24 Hours a Day,
365 Days a Year!**





Of all the computer vendors
in this magazine, how many
offer you the assurance of
UL Listing?

One that we know of:

ZEOS[®]

Every System UL listed.

For more information on ZEOS systems
call 800-423-5891.

CIRCLE 613 ON READER SERVICE CARD

John C. Dvorak



The PCMCIA PC-Card and The Future

Japan doesn't have a monopoly on technology. Good ol' American ingenuity has come up with what may be the next quantum leap in personal computers.

If you've ever looked at a Poquet computer, Hewlett-Packard's palmtop, or any of a number of Japanese notebook computers, then you've seen a memory card that fits into these devices—loosely called a JEIDA card. JEIDA stands for the Japan Electronics Industry Development Association. The size of a credit card, this memory card might hold a copy of *Lotus 1-2-3* or substitute as a DRAM-based silicon hard disk in some systems. A small round battery keeps the DRAM version alive for a year or more. This card will be one of the most important developments in personal computing. Here's the kicker: It's an American invention. It's

about time the true promoters got the credit they deserve.

In fact, the card should be referred to as the PCMCIA PC-Card, or the PC-Card for short. PCMCIA is the

Personal Computer Memory Card International Association (Sunnyvale, Calif., 408-720-0107), and it's the governing body that has standardized the specifications for this card worldwide. JEIDA works with the PCMCIA; its specifications are identical. But make no mistake: The PCMCIA is the lead organization when it comes to this card. It's amusing how we sometimes assume that any new development, especially when it comes to anything regarding miniaturization, is from Japan. So let's stop calling this the JEIDA card.

What do we know about the PCMCIA, and what will the benefit be to users? The PCMCIA has over 150 member companies, including the likes of DuPont, Epson, Fujitsu, Hewlett-Packard, Intel, Lotus, Maxell, Mitsubishi, Motorola, and Zenith. The original specification released in May 1990 became the standard PC-Card we've begun to see on certain laptops, palmtops, and notebook machines. The current release of the PC-Card is Version 2.0 (which is identical with the JEIDA 4.1).

Version 2.0 is important to users because it will revolutionize portable computing. It may even become a standard on desktop machines worldwide because the PC-Card eliminates

piracy and prevents virus infection. The original PC-Card was like a silicon hard disk. Programs would be loaded from it into memory. Release 2.0 allows what is termed XIP (execute in place). The code is executed from the card itself. Designed primarily for ROM cards, it can work with any type of memory.

More importantly, though, the new release of this card adds dual voltage operation to take advantage of the upcoming 3.3-volt standard (see this issue's Inside Track) and a second interface to take advantage of I/O operations. Thus the card can now be an I/O device such as a modem or LAN adapter. Imagine a 9,600-bps V.42bis modem on a credit card!

With memory prices continually declining, at some point disk drive makers will finally give in to the PCMCIA's PC-Card. Mitsubishi has already announced a 12MB DRAM PC-Card, and the current design spec supports up to 64MB. Imagine a credit card holding 64 megs of fast silicon memory. You could make a PC-Card mirror a 64MB partition of the hard disk on your desktop machine for convenient backups and data transfer to your notebook PC. What could be easier?

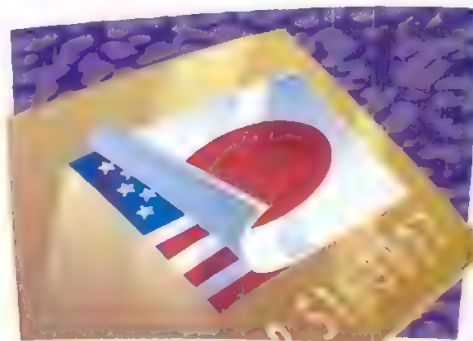


ILLUSTRATION DON BAKER

I expect to see desktop computer makers install a PC-Card slot in the front of their machines next year. It's already common to see this in systems sold in Asia. The PCMCIA PC-Card will be a tremendous success because it solves so many problems associated with portable computing. Familiarize yourself with this standard and the PCMCIA. I believe a lot of people are going to be caught off guard when this technology hits a home run.



THE SCREAMING SPEED YOU NEED

Windows Accelerators, from \$499*

Where we're going, there are no speed limits. ATI® Graphics Accelerators boost graphical applications like Windows® to escape velocity — and beyond.

PC Magazine picked our 8514•ULTRA® as their Editors' Choice among high-end graphics cards, calling it "...the fastest Windows performer." Now our new Graphics Vantage® takes its place alongside the 8514•ULTRA and the Graphics ULTRA®, as the most economical way of accelerating your PC beyond earthbound speeds.

Powered by the same Mach 8® graphics engine as the ULTRA products, the Graphics Vantage delivers resolutions from VGA® upward, and propels 800x600 and 1024x768 modes — in 256 dazzling colors — to over eleven times the

speed of Super-VGA adapters. It's like transforming your 386 into a rocket-powered 486 — instantly.

Our CRYSTAL Fonts® and flicker-free refresh rates — up to 72 Hz — clarify Windows with "near laser quality" text, readable down to 5 points even on 14" monitors. We've also equipped the Graphics Vantage with a Microsoft®-compatible mouse — and a down-to-earth price that will definitely give you no cause to scream — except perhaps with amazement.

ATI Graphics Accelerators. Because in today's world, there's no such thing as "fast enough."

GRAPHICS VANTAGE

One of the ATI Graphics Accelerators™



GRAPHICS VANTAGE

ATI TECHNOLOGIES INC.
3761 Victoria Park Avenue
Scarborough, Ontario
Canada M1W 3S2
Telephone: (416) 756-0718
User Support: (416) 756-0711
Facsimile: (416) 756-0720

Copyright © 1991 ATI Technologies. Trademarks are registered by their respective companies. *Suggested retail price, dealers may sell for less.

CIRCLE 337 ON READER SERVICE CARD

Inside Track

At this point **all the experts agree**. 1992 will be the year when the 386 completely takes over the market for desktop

computing. The latest and possibly most important entrant is, again, from AMD. The company announced a 3.3-volt 386 microprocessor. This is almost half the voltage currently required. Combined with special slow-down circuitry and CMOS design, AMD says you can expect the next wave of ultralightweight notebook 386 machines **to last 7 to 8 hours** without recharging. It will be the standard by which notebooks are judged by the end of next year.

The **3.3-volt technology** has been talked about in the computer business for years, but the microprocessor itself was one of the **stumbling blocks**. Look for this 3.3-volt technology to be the only thing found in notebooks and perhaps in all desktop computers within the next three or four years.

ACE Makes Waste Dept.: I was amused to see the **bickering** already beginning in the ACE consortium. It now seems that each company involved is starting to put its vested interests ahead of the interests of the group—a common American trait. As you may recall, the original ACE consortium proposal had OS/2 as its core operating system. Microsoft was still **in bed** with IBM and working on OS/2 at the time, however. Since then, Microsoft has **pulled out** from the codevelopment work of OS/2, and the ACE group has **picked Unix** as the operating system and has gone so far as to talk to Sun Microsystems. More recently, Microsoft Corp. suggested using *Windows NT*—a nonexistent product.

Now Digital Equipment Corp. wants ACE to use **VMS!!** The group decided to use a laundry list of operating systems. This is apparently getting **worse by the minute**. The laundry list mentality is spreading to hardware now, and the concept of a “standard” machine seems to be falling by the wayside.

This is going to be far **worse** than the EISA committee. That went through all sorts of machinations to design a mere connector. At one point Compaq and Zenith each shipped a press release describing the EISA connector. Both were different! Then EISA ran into a **brick wall of apathy** as only a few buyers wanted to pay the extra money for EISA. It's now a niche machine and used mostly as a file server. ACE has many of the same corporate participants that worked on EISA.

Meanwhile, the 1992 action in terms of volume will be high-speed 386 boxes utilizing the ISA bus. I suspect this will finally **jar loose** some 386 code for the mass market. The lowest common denominator will no longer be the 8086 instruction set. It's **dead** as of now.

AMD expects the next wave of 386 notebook PCs that use its low voltage chip to last 7 to 8 hours without recharging!

Scrooge and the Grinch Who Stole Christmas Dept.:

A recent report in the anniversary issue of *Bartender Magazine* reports on **corporate tipping**. Using statistics **compiled from over 1,000 restaurants and bars** around the nation, the magazine concluded that **IBM employees** topped the list as the **worst tipplers**. I'm sure that congratulatory memos will be flying within the corporation. After all, just because many waiters and waitresses pretty much live on tips doesn't mean anyone has to give them tips—good service or not. The magazine goes on to name so-called “computer kids” among the **Seven Stiffs**—people who avoid tipping altogether. This group shares honors with doctors, teachers, accountants, lawyers, **women over 40, and lounge lizards**.

CEO's, mobsters, and small-business owners were all cited as good tipplers. This all means something, but I'm not sure exactly what. I think it might mean that the trend on the West Coast will take hold nationally—the tip is included on the bill, European style. Now to reward someone for great service you have to **pay even more!** I want to personally thank all the **tightwads in the industry** for helping make this happen.

1992 Software Product of the Year Dept.: Maybe I'm premature on this award, but one of the **finest products** I've seen in the last five years is *Caller ID + Plus* from

Rochelle Communications, 8920 Business Park Dr., #125, Austin, TX 78759; 800-542-8808, 512-794-0088, fax: 512-794-9997. This \$295 gem works with local phone systems that utilize the premium phone service called “Caller ID.” Caller ID gives phone users the opportunity to see what phone number they are receiving calls from. This will virtually **eliminate crank calls** and stop anonymous harassment.

The **real benefit** from this technology will be when people use it in conjunction with a product such as *Caller ID + Plus*. Here's what you do: The phone line is routed through the computer. When an incoming call is received, the Caller ID system alerts the software running on your computer, which then looks up the person calling. Once the database of associates is done, you can expect to see the caller's name plus whatever information you might have in the database pop up on your screen (as the phone rings). Unknowns are entered on the fly, too. This is a call screener's dream come true! The system also logs all calls in and out and the user can make on-the-fly notes about each call and put it into a **master log**. This has to be a **killer program** for any salesperson worth his salt. You have to see this program in action to appreciate it. **Hot, hot, hot!** Three hot's and a snap! Highly recommended. ■

We refined the refinements, improved — and bettered the best-selling

Introducing two new Quicken. One adds over 50 new features for more power and convenience than ever. The other adds the advantages of Windows to the world's most popular financial software.

Why friends tell friends about Quicken. More people buy Quicken because of word-of-mouth recommendations than any other reason.

We think it's because we're obsessed with listening and responding to our customers. We never stop looking for ways to improve the improvements.

From watching PC rookies use Quicken, we developed our patented, automatic check alignment system. And we discovered ways to make our menus more accessible.



Follow-Me-Home research: Intuit engineers visit new buyers to study their first session with Quicken. As a result, we've introduced a new step-by-step guide for those who want help getting started.

Each year we survey 10,000 users to learn how they'd change Quicken. These surveys led to Quicken 5.0's advances in report flexibility and automatic budgeting.

With Quicken, you have the culmination of years of refinements...and a future of relentless improvements.

That's how Quicken has grown — from a simple checkbook manager into a powerful financial tool that categorizes expenses as you pay bills, reports exactly where your money goes, furnishes tax reports, tracks your investments, and keeps the books for thousands of small businesses — all with the intuitive simplicity and speed of the original.

Mouse support was the top request in Customer Suggestion cards. It's in both new versions.

Introducing new Quicken 5.0.



Name just about anything you like about Quicken, and we'll tell you how it's more powerful, more flexible, faster, and even easier now.

New reports and flexible reporting features. Now you can collapse or expand reports "outline-style" to

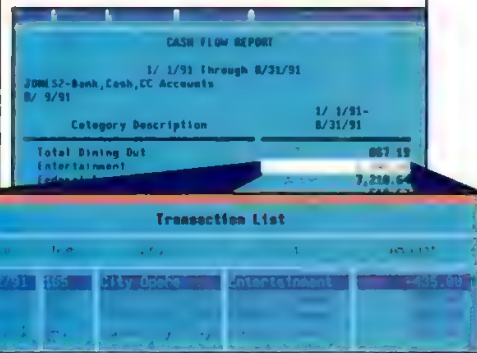
see as much or as little detail

as you want.

A keystroke or a mouse click lets you "zoom in" on a number to see the details behind it, then zoom in even closer — to the transactions behind the detail.

You can even reformat a report while you look at it. So, for example, to see transactions by payee instead of by date, you just choose among formats on the new pull-down menus.

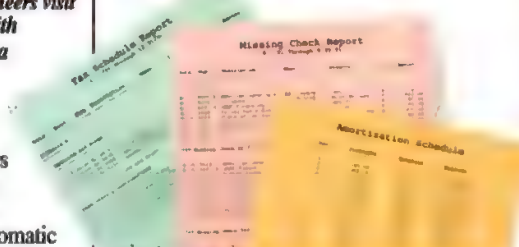
No need to leave the report — the transactions instantly re-sort.



Ever question a number in a report? One keystroke, and a new QuickZoom screen pops up with the supporting details. Need more detail? Tap that key again to zoom in on any transaction.

New tax information. New Loan Amortization calculates the interest and principal automatically each time you make a house payment and correctly categorizes each. And now Quicken automatically transfers data to the right lines in the right schedules of leading tax programs.

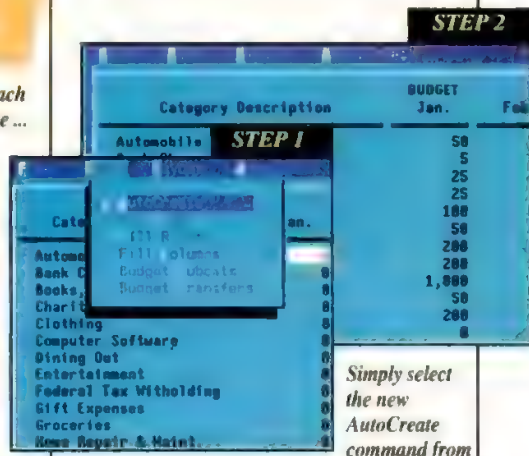
Plus much more! Edit memorized transactions ... make memorized % splits ... find specific items by typing in just a few characters ... try user-defined QuickKeys ... get wallet-size laser checks ... and that's just a taste — in new Quicken 5.0 you'll discover one pleasant surprise after another.



New reports show interest and principal for each house loan... reveal missing checks at a glance ... provide tax schedules ready to submit with your returns, and more.

New budgeting power. We've made the hardest part — creating a budget — simple and fast. You can copy one month's budget to all other months or let Quicken automatically create a budget for you based on your actual spending, and tweak it from there.

We've made budgeting more precise, too, with subcategories. Under "Automobile" for example, you can allocate separate amounts for gas and maintenance. You can also budget a yearly amount for a category and let Quicken allocate it quarterly or monthly.



Simply select the new AutoCreate command from the new pull-down menu and Quicken automatically fills in your budget based on last year's spending. Now play "what-if" until you see the results you want, and you've got a detailed plan to meet your financial goals.

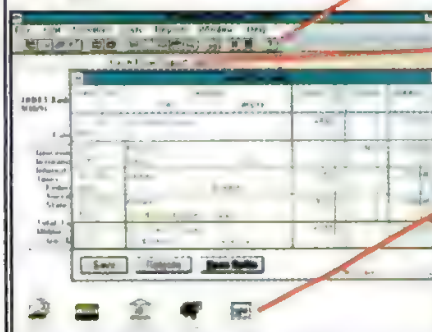
the improvements, advanced the advances financial software in the world.

And new Quicken for Windows.



Quicken is simply the most powerful financial software available in Windows. Only Quicken for Windows has all the familiar features that have made Quicken 4.0 the world's most popular financial software. And adds features you won't find anywhere else. Quicken is the only

Windows financial software that handles all your finances, including your stocks, bonds and mutual funds. So you can get Capital Gains reports for tax preparation, and see how your investments have performed over time.



No other Windows financial software pays bills electronically via the CheckFree® payment service or memorizes your customized report settings, saving you time and hassle every month.

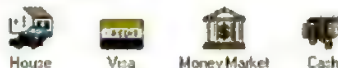
Only Quicken gives you the option of automatically memorizing every bill or letting you memorize only the most important ones. And only Quicken gives you QuickScroll™, to move through your register lightning fast.

With Quicken you get features, ease, and power that no one else brings to Windows, as well as the flexibility to do what you want.



Quicken's icon bar and customizable desktop put the most frequently used functions and accounts at your fingertips for quick "push-button" access.

Only Quicken lets you see multiple account and report windows on screen at once, so you can investigate the detail behind numbers and easily plan and forecast.



Create your own Quicken desktop, and keep your most frequently used accounts, lists and reports where you can always find them fast.

Upgrade at your software dealer — and get \$15 back!

Quicken owners: Buy either new version of Quicken at your favorite store before December 31, 1991 and get \$15 back.

Here's how:

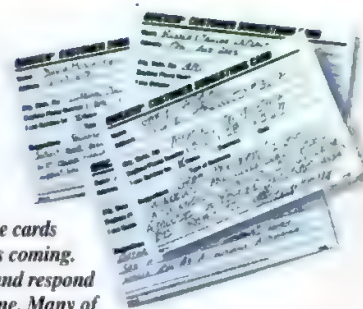
- 1) Buy either Quicken 5.0 or Quicken for Windows at your local dealer. (Some stores are providing the \$15 rebate at the time of purchase. These purchases do not qualify for another rebate by mail.)
- 2) Circle Quicken's purchase price and date on your store receipt.
- 3) Turn to the back of your old Quicken manual and tear out the Special Offer Coupon #2.
- 4) IMPORTANT: Fill out the information on the back of Special Coupon #2. On the "Additional Information" line, write in your disk size preference (3.5" or 5.25") and whether you bought: Quicken 5.0, Quicken for Windows, or the Quicken/TurboTax combo. (Combo available in stores about 11/11/91.)

- 5) Mail your original store receipt along with your completed Special Coupon #2 to: Quicken Rebate Offer, 5070 Santa Fe Street, San Diego, CA 92109
- 6) Receive your rebate check for \$15 within 6 weeks.



Important Information: Offer valid only for owners of Quicken versions 1-4. Rebate good on retail store purchases of Quicken 5.0 or Quicken for Windows only (rebate good on one or the other, not both). Mail-in rebate not valid for Quicken purchased at stores giving the rebate at the time of purchase. Your receipt must be dated by December 31, 1991, and your letter postmarked by January 15, 1992. Original store receipt and original Special Coupon #2 must accompany request. No mechanical reproductions, photocopies or faxes accepted. Void where prohibited by law.

SPECIFICATIONS: IBM/DOS: Any IBM-compatible PC with at least 512K RAM and DOS 2.0 or higher, a hard disk or two floppy disk drives, one of which must be high density. Guaranteed to work with your monitor and printer or your money back. **IBM/Windows:** Requires 2MB RAM, DOS 3.0 or higher, Windows 3.0 or higher, and a hard disk. Works with any printer or monitor supported by Windows 3.0. **General:** Also available for Macintosh. Feature sets vary. CheckFree not available outside the U.S. Free technical support. Not copy protected.



Keep those cards and letters coming. We read and respond to every one. Many of the best ideas for Quicken come this way.



Award-winning design is no accident. Quicken's elastic design is made to fit you. You're never asked to change your financial habits.

Two easy, money-saving ways to upgrade.

1. Get a \$15 rebate when you upgrade at your dealer, or
2. Use the coupon below, or call toll-free

1-800-624-8742

24 hours a day, 7 days a week, U.S. and Canada.

Guarantee

If you're not satisfied with any Quicken product for any reason, simply return it within 60 days for a full refund — no questions asked.

- ☐ YES, I want to upgrade. Send me:
 — Quicken 5.0 for just \$29.95 or
 — Quicken for Windows for just \$29.95.
 I own Quicken (circle) 1 1.5 2 3 4 now
 and I'm including the original Special Coupon #2 from the back of my Quicken Manual.

- ☐ YES, send me Quicken for just \$69.95.
 — DOS 5.0 — Windows

Disk size: — 3-1/2" — 5-1/4"

Name _____
 Address _____
 City _____ State _____ Zip _____
 Day Phone _____

☐ Check enclosed (no COD or purchase orders)
☐ Visa ☐ MC ☐ AmEx ☐ Discover
 Card# _____
 Exp. Date _____
 Signature _____

Allow 3-4 weeks for delivery. CA, MN residents add sales tax. International shipping extra.

Mail to:
Intuit

P.O. Box 3014, Menlo Park, CA 94026
 Or Call: 1-800-624-8742
 U.S. and Canada

Ad Code: PB12W

INTRODUCING DR DOS 6.0 THE DOS THAT CONQUERS SPACE... AND BEYOND.

*More memory
for your
applications.
Twice the hard
disk space.
Superior
productivity.*

DR DOS 6.0 is here. A major upgrade to the award-winning DR DOS 5.0, this is the DOS operating

system that conquers the limitations of your PC's memory and hard disk space. Fully DOS-compatible, with free product lifetime support, it's the best thing that ever happened to DOS.

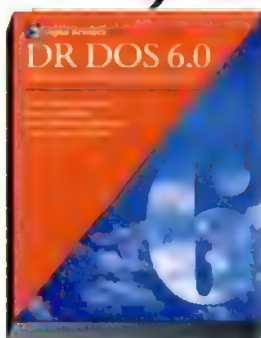
*Give your
applications
more room
to run.*

DR DOS 6.0 lets you run even the biggest DOS and Windows applications.

It loads itself into upper and high memory along with buffers, device drivers, TSRs, and network drivers – delivering consistently more memory than the competition on Intel 8088/86, 80286, 386 and i486 PCs and compatibles.

*Don't get
a new hard
drive. Just get
a new DOS.*

With DR DOS 6.0's optional file compression, a typical 40MB



*hard disk
can hold up
to 80MB of
data! You
also get a
high perfor-
mance disk
cache for dramati-
cal-*

ly improved software performance. And a disk defragmentation utility for speedier data access.

*Make your
PC work for
you, not
against you.*

DR DOS 6.0 gives you the most advanced DOS technology,

plus comprehensive password security to protect your system and data, on-line help and documentation, lightning-fast task switching for improved productivity, file recovery commands and much more.

**Get the
facts by fax:
1-800-955-DOS6
Request Document 603
Or call us at:
1-800-274-4DRI**

Expand
your PC's
universe
with DR
DOS 6.0.
Let us fax

you the facts, or call us for details and the name of the DR DOS reseller nearest you.

	MS DOS 3.X	MS 5.0 UPGRADE	DR DOS 4.0
FULLY DOS-COMPATIBLE	■	■	■
MAXIMUM MEMORY ON 1386 & 1486 PCs	575k	621k	627k
MAXIMUM MEMORY ON 80286 PCs	575k	621k	628k
MAXIMUM MEMORY ON 8086/88 PCs	588k	578k	612k
DOUBLE THE STORAGE CAPACITY OF TYPICAL HARD DISK			■
READ & WRITE HIGH-PERFORMANCE DISK CACHE			■
DISK DEFRAGMENTATION			■
COMPREHENSIVE PASSWORD SECURITY SYSTEM			■
UNDELETE		■	■
TASK SWITCHING (NO. OF TASKS)		14	20
FAST TASK SWITCHING VIA COMMAND LINE OR GRAPHICAL SHELL USING EXPANDED/EXTENDED MEMORY			■
CUT & PASTE BETWEEN TASKS			■
ON-LINE DOCUMENTATION & HELP			■
PC-TO-PC FILE TRANSFER			■
FREE PRODUCT LIFETIME SUPPORT			■
FULLY BOOTABLE	■		■

*1486/1486/1486/1486/1486/1486



Digital Research.
WE MAKE COMPUTERS WORK



Digital Research and DR DOS are registered trademarks and the Digital Research logo is a trademark of Digital Research, Inc. All other brand, product or company names are trademarks or registered trademarks of their respective owners. Copyright © 1991 Digital Research Inc.

Jim Seymour



Pricing LAN Software Sensibly

If software publishers made life easier for network managers, both sides would benefit in the long run.

In my last column, we looked at how irrational and unworkable LAN application pricing has become. This time I want to pass along my biased and opinionated suggestions on how we can bring some logic to this mess.

Keep in mind the three-tier model I set out last time for LAN-applications pricing. On the first level: Is the price for the software a flat fee, or does it depend on the number of users?

Second, if a program's price varies by the number of users, is that price determined by the maximum number of concurrent users, or must the purchaser buy a separate license for every "named user?"

Finally, how is per-user pricing set? Is it easy to add users a few at a time, or only in large blocks? And is the effective net price per user at large sites realistic?

On the first level, software publishers pay too little attention to the idea of server pricing. It was common in the early days of LANs, but as manufacturers saw huge revenue possibilities in widespread network

use of their products, most went toward some form of per-user pricing.

But for a lot of smaller apps, server pricing makes more sense on both sides of the counter than site licensing. Software vendors with clever utilities are missing a bet by not offering their packages for flat per-server fees.

In fact, per-server pricing should be just one option. Flexibility in pricing would make every network manager's life easier. Not *cheaper* pricing, necessarily—they're willing to pay fair prices—but simply a choice among several reasonable alternatives.

On to level two of the model: named-user versus multiple-concurrent-users pricing. There is no middle ground here. Named-user pricing is an unacceptable business practice. Network managers get livid when they talk about named-user licenses.

Gordon Eubanks, CEO of Symantec, knows exactly what's wrong with named-user pricing: "Named-user pricing is hard to administer on both sides of the relationship; it fosters a perception of greed, and it actually works

against software publishers' best interests by encouraging illegal copying. It's hopeless."

A PRICING SCHEME FOR EVERYONE

It's hard to imagine a more burdensome approach than named-user pricing. By contrast, maximum-number-of-simultaneous-user pricing is clean and simple. It forms a continuing business relationship with the customer, and it shows that the vendor understands the realities of network managers' jobs.

Simultaneous-user pricing actually encourages software customers to keep their operations clean. And it encourages users to try a program they might otherwise never see. Good software benefits, too: When enough users try and like a package, they begin using it regularly, and their LAN manager goes back to the vendor and buys a license for a larger number of users. Everyone wins.

Yet until recently, named-user pricing held sway. The screams of angry network managers are finally getting through, though, and some companies are changing their policies.

Some are going further.



ILLUSTRATION DON BAKER

Lotus has a particularly enlightened approach, at least where network pricing and monitoring usage is concerned. Monitoring simultaneous usage is usually handled through a software "counter" at the server. This counter checks out to connected PC users up to the maximum number of licensed copies of the program. Lotus lets network licensees turn off 1-2-3's counter if they have another way of monitoring usage.

That makes life easier for the network manager who abruptly needs to make a pro-

Discover PREMIER

PREMIER is PC Magazine's innovative resource for PC buyers. Turn to **PREMIER** for an array of dynamic companies and their exciting PC products and services.

Examine state-of-the-art hardware, software and accessories, poised to become household words in the PC industry. All spotlighted at your fingertips in an easy-to-find, full color showcase. Discover it for yourself: start on page 436 and explore the world of **PREMIER**.

Advertisers: To target over 800,000 PC buyers in this high impact, cost-effective section, call 1-800-825-4237



It's here...

PREMIER



Jim Seymour

gram available to one or two more people. He can settle up with Lotus on the license tomorrow; today he can focus on getting those people to work.

It also makes it easy to use third-party network-management programs, which provide that counter function across many titles. It's chaos to monitor your users through such a counter for programs A, B, C, and D but then have to fall back to a separate counter built into program E.

Finally, how much should customers pay per user—especially for the *n*th user at large sites? And how easy is it to add just a few new users?

Most vendors take the view that while the cost of adding users should decline as their numbers increase, that curve should level out after a couple of hundred users. Customers, on the other hand, believe they should get steadily deeper discounting as they increase the number of licensed users. Especially in large companies where there may be thousands of licensed users, network administrators want to see a really low additional cost per user for adding, say, the 4,500th through 5,000th users to an existing license.

I don't think there's a reasonable argument for pushing down the price much further than the 25 to 30 percent discount usually in effect at the 200-user level. Sure, the additional cost to the vendors is negligible, so their net return is very high. But software has always been value-priced, its price justified by its functionality, and that 201st user isn't going to get any less value than the 200th user.

But software vendors must make it easier to add new users. Too many LAN apps add new-users licenses in large chunks—five or ten users at a time. That's no problem for MegaCorp., but it's agonizing for Countem Out CPAs, which has five licensed users (on the original five-user network license pack) and wants to add just one more. If these guys have to buy additional-user licenses in five-user blocks, they're going to pay a heck of a premium for that sixth user. Instead, they'll feel justified in saying to hell with the license and will just load the software on user No. 6's PC and forget about it.

The answer is easy: Vendors, make network managers' lives simple. Make it easy to administer licensing, and make it easy to add new users a few at a time. ■

EPS

Technologies

PRESENTS

COMPUTER

LEAGUE

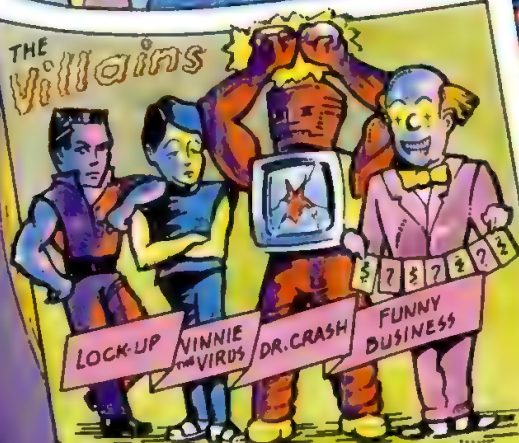
VOLUME 1, ISSUE 1



PUTER WORLD

puter
world, def.
planet of
computer
technology

THE Villains



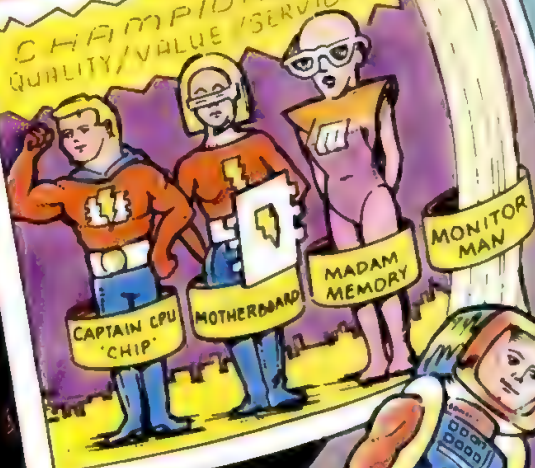
LOCK-UP

NINNIE
the VIRUS

DR. CRASH

FUNNY
BUSINESS

CHAMPIONS OF QUALITY/VALUE/SERVICE



CAPTAIN CPU
'CHIP'

MOTHERBOARD

MADAM
MEMORY

MONITOR
MAN

T

HE SNOW FALLS
SILENTLY ON 'THE CITY'
BUT NOT ALL IS QUIET
IN PUTER WORLD. FROM
ATOP THE EPS BUILDING,
THE COMPUTER LEAGUE-
CHAMPIONS OF QUALITY,
VALUE, & SERVICE-KEEPS
AN EVER-VIGILANT EYE
FOR THE TELL-TALE SIGNS
OF HAVOC WREAKED BY
THE VILLAINS OF THIS
COMPUTER WORLD.

WATCH
FOR COMING
EPISODES

Design Excellence High Performance

COMPUTER
WORLD



MR 'TOPPS', CEO
THE MAN IN CHARGE

Innovation

Performance



Value

NEW/HOT
EPS SX/20 MHz
STEALTH®

"Finally, an elegant sophisticated piece of high performance equipment that demands your visual attention. At the right price."

\$1,595



0039 90 671 871

0041 72 722 111

800 477 0921

EPS SX/20 MHz Stealth

- INTEL 80386/SX-20 MHz Processor
- 2 Megs 0 Wait State RAM (Expandable to 6 Meg)
- Socket for the 80387-SX 20 Co-Processor
- Power, Turbo and Hard Drive LED Display
- AWARD BIOS/Clock Calendar
- 2 Serial/1 Parallel/1 External Floppy Port
- 1 Bus Mouse Port & Scanner Port
- Built-in 3.5" 1.44 Floppy Disk Drive
- Conner 120 meg IDE HD
- EPS 14" Color Monitor 1024 x 768 SVGA .28 Dot Pitch
- Built-in 1 Meg SVGA Video Card
- External 101/102 Keyboard Compatible, Adaptor for Mouse Port
- 85/86 Key Keyboard with 12 Function Keys (101 or 102 Key Compatible)
- 9600/2400 Fax/Modem Capability (optional)
- Carrying Case Included
- System wt. 8lbs. System Dimensions W 1 3/4" D 8" H 10 1/4"
- MS Windows 3.0 w/Logitech 3 Button, 400 DPI Mouse
- MS Works ver. 2.0
- MS DOS 5.0
- 60 Day Money Back Guarantee
- 1 Year Warranty
- System User Manual
- Call for Customizing Options

As reviewed in



EPS Technologies

"a tradition of value and performance"

Order Toll-Free

1 800 447 0921

also available in Canada

Call today and purchase your EPS system in the following ways:



Leasing Options

GSA Contracts

#GS00K91AGS5035

Purchase Orders upon approval
Cashiers Check, Money Order

(allow two weeks for company checks to clear)

EPS Technologies, Inc.

10069 Dakota Avenue

P.O. Box 278

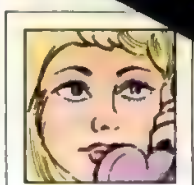
Jefferson, SD 57038

605 966 5586

Fax Orders 605 966 5482

Tech Hotline

1 800 526 4258



VAL TRUEPENNEY
SYSTEMS ANALYST
WOMAN IN CHARGE



EPS SX/20 MHz Notebook

- INTEL 80386/SX-20 MHz Microprocessor
- 2 Megs of Memory Expandable to 5 Meg
- Socket for the 80387/SX-20 Co Processor
- AMI BIOS/Clock Calendar
- Parallel and Serial Ports
- Built-in 3.5" 1.44 Floppy Disk Drive
- Conner 80 meg IDE HD
- Backlit LCD High Resolution VGA Display (640 x 480)
- 16 Grey Scales
- External Monitor Interface
- External 101/102 Keyboard, Adapter for Mouse Port
- 80/81 Key Keyboard with 12 Function Keys
- Quick Charge or Trickle Charge using 100V - 200V AC/DC Converter
- Removable Nicad Battery Pack
- System wt. 6.3 lbs. System Dimensions W 11 5/8" D 8 1/4" H 1 7/8"
- System User Manual
- 1 Year Warranty
- 60 Day Money Back Guarantee
- Call for Customizing Options

\$2,195

EPS SX/25 MHz Notebook

Same configuration as above except with true AMD 80386-SX-25 MHz CPU

\$2,295

GSA Contracts
#GS00K91AGS5035



EPS 386SX-25 MHz

- AMD 80386/SX-25 MHz Microprocessor
- 4 Meg 0 Wait State RAM Expandable to 8 Meg
- Desktop Case/220 Watt Power Supply
- Socketed for 80387/SX Co Processor
- AMI BIOS/Clock Calendar
- 2 Ser./ 1 Par./ 1 Game Port
- Slots 8-16 Bit
- TEAC 1.2 MB and 1.44 MB Floppy Drives
- MAXTOR 80 Meg IDE HD (15ms) (150,000 hr. MTBF)
- EPS Non Interlaced 14" Color Monitor 1024 x 768 SVGA .28 Dot Pitch
- 1 Meg SVGA card 1024x768 w/SIERRA DAK Chip (1 Meg for 256 Colors at 1024 x 768) (1 Meg for 32,768 Colors at 800 x 600)
- 101 Keyboard
- MS Windows 3.0 w/Logitech, 3 Button, 400 DPI Mouse
- MS Works ver 2.0
- MS DOS 5.0
- System Users Manual
- 1 Year Warranty / On-Site Service
- 60 Day Money Back Guarantee
- Call for Customizing Options

\$1,695

EPS 386-25 MHz

Same configuration as above except with true INTEL 80386-25 MHz CPU

\$1,795

The brands and product names mentioned are trademarks or registered trademarks of their respective holders. Prices are subject to change due to the volatility of the Market. 80386 & 80486 are trademarks of INTEL.



EPS 386-33 MHz

- INTEL 80386/33 MHz Microprocessor
- 4 Meg 0 Wait State RAM Expandable to 64 Meg
- 128K Cache (25 NS) Expandable to 256k
- Desktop Case/220 Watt Power Supply
- Socketed for 80387 or Weitek Co Processor
- AMI BIOS /Clock Calendar
- 2 Ser./ 1 Par./ 1 Game Port
- Slots 1-8, 6-16, 1-32 Bit
- TEAC 1.2 and 1.44 MB Floppy Drives
- MAXTOR 80 Meg IDE HD (17ms) (150,000 hr. MTBF)
- EPS Non Interlaced 14" Color Monitor 1024 x 768 SVGA .28 Dot Pitch
- 1 Meg SVGA Card 1024 x 768 w/SIERRA DAK Chip (1 Meg for 256 Colors at 1024 x 768) (1 Meg for 32,768 Colors at 800 x 600)
- 101 Keyboard
- MS Windows 3.0 w/Logitech, 3 Button, 400 DPI Mouse
- MS Works ver 2.0
- MS DOS 5.0
- System Users Manual
- 1 Year Warranty / On-Site Service
- 60 Day Money Back Guarantee
- Call for Customizing Options

\$1,895

EPS 386-40 MHz

Same configuration as above except with true AMD 386-40 MHz CPU and 128k Cache maximum

\$1,995

EPS Technologies
"a tradition of value and performance"



EPS 486-33 MHz

- INTEL 80486/33 MHz Microprocessor
- 4 Meg 0 Wait State RAM Expandable to 64 Meg
- 128K Cache (25 NS) Expandable to 256k
- Desktop Case/220 Watt Power Supply
- Socketed for Weitek 4167 Co Processor
- AMI BIOS/Clock Calendar
- 2 Ser./ 1 Par./ 1 Game Port
- Slots 1-8, 6-16, 1-32 Bit
- TEAC 1.2 and 1.44 MB Floppy Drives
- MAXTOR 213 Meg IDE HD (15ms) (150,000 hr. MTBF)
- EPS Non Interlaced 14" Color Monitor 1024 x 768 SVGA .28 Dot Pitch
- 1 Meg SVGA Card 1024 x 768 w/SIERRA DAK Chip (1 Meg for 256 Colors at 1024 x 768) (1 Meg for 32,768 colors at 800 x 600)
- 101 Keyboard
- MS Windows 3.0 w/Logitech, 3 Button, 400 DPI Mouse
- MS Works ver 2.0
- MS DOS 5.0
- System Users Manual
- 1 Year Warranty / On-Site Service
- 60 Day Money Back Guarantee
- Call for Customizing Options

\$2,795

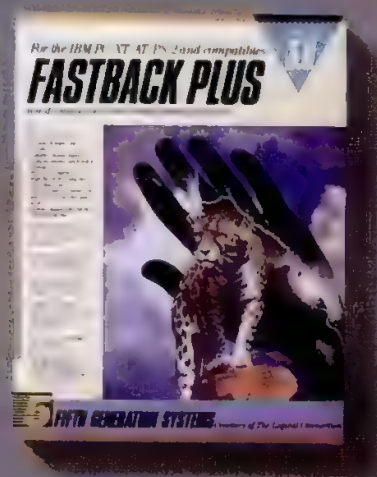
EPS 486SX-20 MHz

Same configuration as above except with true INTEL 80486SX-20 MHz CPU and 130 Meg Hard Drive

\$2,295

Order Toll-Free
1 800 447 0921
also available in Canada
CIRCLE 284 ON READER SERVICE CARD

Backup.
For people who
don't.



Everyone who uses a PC ought to back up regularly. But most people don't back up at all.

In fact, if the people you work with are like those working in most places we know, about the only way their data is going to get backed up is if it happens without them.

Guess what?

Now it can.

Now you can set up fully automatic, unattended backups for every PC in the house.

What's more, you can easily customize the nature and timing of each one to suit *your* specifications.

And transform a simple, effective backup policy from fantasy into fact.

All you need is Fastback Plus 3.0.

The latest version of the world's most popular backup software comes complete with a backup policy of its own—in the form of pre-designed scheduling templates—that you can adapt with our unique Macro Editor.

What makes our Macro Editor unique?

It uses plain English commands.

Which means you can actually use it.

Using Fastback Plus is even easier than before, thanks to our new Windows®-style interface. While our convenient new Express Menu lets you perform a full backup with a couple of strokes or clicks.

If there are a couple of kinds of computers in your workplace, you'll want to know that using Fastback Plus on PCs is very much like using Fastback Plus for the Macintosh®—same look, same functionality.

Same backups, even.

That's right. You can actually re-

store a Mac file directly onto a PC, and vice versa.

Nobody else can do that.

But then, nobody else can back up more than 3MB per minute on an AT. Or up to 10MB per minute on a '386.

And nobody else comes close to our level of reliability.

You can destroy as much as 11% of the data on a diskette and Fastback Plus will recover every last byte, error-free.

Unbelievable?

That's what the people at *InfoWorld* thought.

So they "scratched both disks with the point of a knife to simulate accidental damage" and found, to their astonishment, that Fastback Plus "was 100% successful at restoring all the [damaged] files."

Still unsatisfied, they "ran the test several more times, increasing the severity of damage until we began to fear for our disk drives, but we were unable to generate a single byte of unrecoverable data."

We wouldn't recommend trying this test yourself. But if you insist, you'll be glad to know that Fastback Plus is backed up by our vaunted 24-hour toll-free technical support and a one-year money-back guarantee.

There's more. So pick up the phone. Dial 1-800-677-1848.

And tell everyone to stand back.



If automated, unattended backups aren't your style, you can still enjoy unprecedented convenience with our new Express Menu, which InfoWorld considers "only slightly more complicated than an on/off switch."



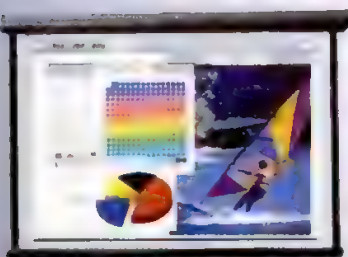
FIFTH GENERATION SYSTEMS, INC.

CIRCLE 288 ON READER SERVICE CARD



At Last, An LCD Projection Panel With All The Colors You Need To Get Your Presentation Moving.

The Sharp QA-1050. 185,000 Colors For Crisp Computer Images
And Live-Action Video.



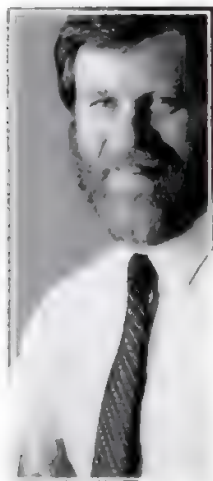
Even the most complex multi-media presentations run smoothly with the Sharp QA-1050. Its 185,000 colors and TFT Active Matrix Technology guarantee computer and video images of unparalleled realism. And animated graphics and live-action sequences that move without ghosts and shadows.

The Sharp QA-1050 offers almost universal computer compatibility, including VGA and MAC® II. And, it also offers the convenience of remote control. In short, everything you need to present what no panel could present before: dramatic, true-to-life, full-motion color.

So, contact your local authorized Sharp Industrial LCD Products Dealer for a demonstration or call 1-201-529-8731. Fax 201-529-9636.

SHARP
FROM SHARP MINDS
COME SHARP PRODUCTS™

William F. Zachmann



Farewell to (Software) Innocence?

As tinkering becomes nostalgia, automated software setups pose new perils.

My very first car was a rusty, aqua green 1952 Buick Special that my dad gave me after I got my driver's license at the age of 16. Like MS-DOS, it was a marvel of simplicity. The in-line "straight eight" engine left plenty of room to work around in the cavernous space under the hood. The manual transmission made it easy to maintain, to fix, and to modify. There wasn't much I couldn't do. What I didn't know, I was able to learn easily.

What a contrast with today's cars! The other day, my 1989 GMC Jimmy 4X4 started racing in idle. I looked under the hood to see what I could do. Nothing! I couldn't even find an idle adjustment screw.

The whole darn thing is apparently run by a computer via a servo mechanism or something! My gas-guzzling Jimmy, though, is relatively simple compared with those really new-fangled fuel-efficient gazillion-valve imports

with engines that sound like sewing machines—cars I refuse to buy.

Which brings us to today's software—and tomorrow's. We are on the brink of a major loss of innocence in software, similar to what has happened with automobiles. Sadly, the days when we could easily pop the hood on our software and figure out what's going on are numbered.

You may want to dismiss my simple-minded "tinkerer's nostalgia." So what if it is getting more difficult even for power users to get under the hood of their software? Won't we all be better off with more powerful software that takes care of the tinkering for us?

Yes and no. If the new software really took care of the maintenance, tuning, and repair of our systems, we would be better off. The problem is that it often doesn't—at least not all the time.

Even in the relatively straightforward realm of character-mode DOS software, matters are starting to get out of hand. Vendors of memory managers, disk utilities, backup systems, anti-virus programs, DOS shells, and other software have rushed to add automatic installation and maintenance capabilities to their products.

While these features do make software more accessible to less sophisticated users, they also give users more ways to get into trouble. Malevolent interactions between the automated setup and configuration functions of different software can cause huge problems. Even a sophisticated DOS power user can have a hard time figuring out exactly what the warring software products have done, or tried to do, to his system. The ordinary user is in a nearly hopeless position.

A more complex situation can occur with *Microsoft Windows*. Solving the complexities of the *Windows* .INI files after they've been messed up can be a daunting task, even to those familiar with the gory details of *Windows*. It isn't surprising that sometimes, the only practical way to solve a problem is simply to reinstall *Windows* from scratch.

These problems are not going to get easier as we move to more powerful 32-bit multitasking systems like OS/2 2.0, *Windows NT*, or Unix. The new software will require more complex, more sophisticated setups and configurations—for applications as well as the operating systems.



ILLUSTRATION DON BAKER

We ought to welcome the efforts of software vendors to make our lives as users easier. But we should require that vendors give us enough information to let us take over the installation and configuration when their automated efforts fail, conflict with other software on our systems, or otherwise go awry.

Users deserve a straightforward explanation of what must be done "under the hood" to install or configure software. We may never get back to the in-line eight motor, but a good owners' manual would be a start. ■

Those of you curious about WordPerfect® for Windows can now stop using your imagination.



WordPerfect® for Windows is here.



Merge

WordPerfect® for Windows is shipping, and its numbers are pretty impressive.

Nearly a million diskettes packed in boxes. Thirty-five semitrucks on the road. And over three hundred thousand dollars in postage just to get our advance orders to you.



Copy

In fact, the only number we still don't have is how many copies of

WordPerfect for Windows will sell in the first 30 days. But it looks like that number will be impressive as well. Advance orders for WordPerfect for Windows are already about 200,000, and we'll have another 400,000 ready to ship within the first month.



Styles

It also looks like the 7,000 people who entered our contest to predict first month's orders of WordPerfect for Windows knew what they were talking about. Even though the average of all the estimates, 640,955, still seems high, it's starting to look more realistic.



And the person whose estimate comes closest will be getting the \$25,000 prize.

What everyone else will be getting is the first Windows word processor with all the power of WordPerfect behind it.

Because for the first time, you can have the unparalleled word processing prowess of WordPerfect 5.1* and the graphical user interface of the Windows environment, all in one powerful package that puts everything

you need to create great-looking documents

right at your fingertips.



Paste

Or, as *InfoWorld* put it after previewing a Beta version, WordPerfect for Windows is "a knock-out for both established

WordPerfect-for-DOS users who are waiting for a Windows product and for current Windows users

who want a no-compromise Windows word processor."



Merge

So now, individual word processing users can work the way they want, in either Windows or DOS, and still have all the advantages of an organization-wide standard. In fact, any WordPerfect 5.1 for DOS documents can be retrieved directly into WordPerfect for Windows—and vice versa—with no conversion necessary.

And if you like both environments, WordPerfect still works for you.

Because if you buy WordPerfect—DOS, Windows or OS/2 (when available)—we'll allow you to be licensed to run any or all of them on the same machine.



Save

Now getting WordPerfect for Windows is as easy as using it.

If you're using any version of WordPerfect for DOS, you can trade over to

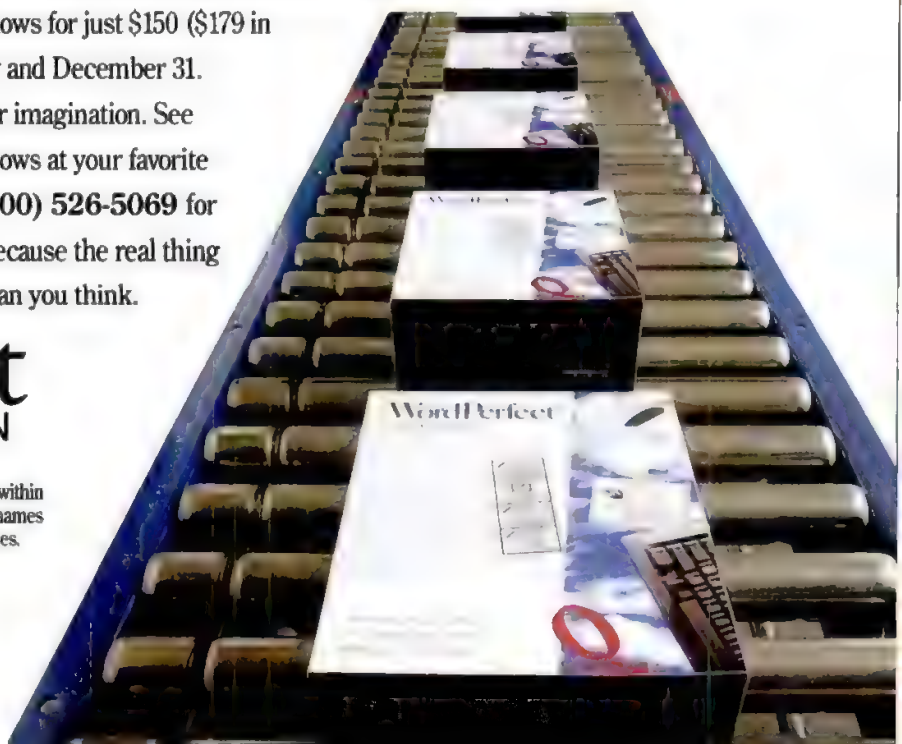
WordPerfect for Windows for just \$99 (\$120 in Canada). We'll also make it easy to trade up from Microsoft Word for Windows. Any Microsoft Word for Windows user can get WordPerfect for Windows for just \$150 (\$179 in Canada) between now and December 31.

So stop using your imagination. See WordPerfect for Windows at your favorite dealer now. Or, call (800) 526-5069 for more information. Because the real thing may be even better than you think.

WordPerfect

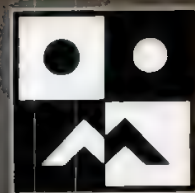
CORPORATION
(800) 526-5069

WordPerfect is a registered trademark of WordPerfect Corporation within the United States and other countries. All other brands and product names are trademarks or registered trademarks of their respective companies.
© 1991 WordPerfect Corporation.





Please do not attempt this on just any computer. Now there's a computer that lets you choose how to work. You can write directly on the screen. Or use the keyboard. It's a fully-compatible 386 DOS®/Windows™ pentop computer



MOMENTA



that's equipped with a wide range of unique, pen-specific software as well as a built-in fax (send and receive). The Momenta™ Computer. Technology has finally caught up with the way you work. To learn more, call 1-800-MOMENTA.

ALL COMPANY AND PRODUCT NAMES ARE TRADEMARKS OF THEIR RESPECTIVE COMPANIES

CIRCLE 483 ON READER SERVICE CARD

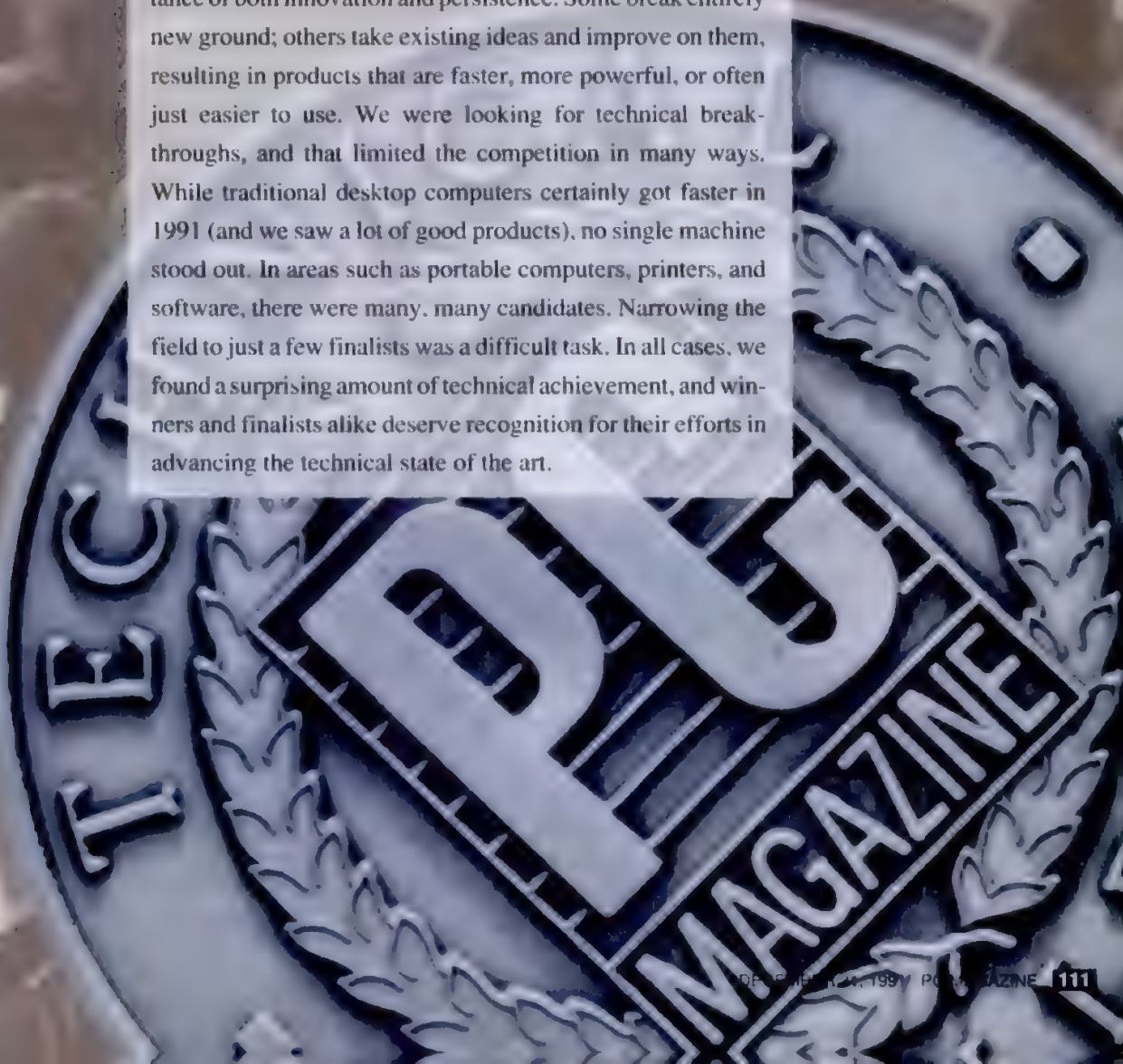
8TH ANNUAL AWARDS FOR TECHNICAL EXCELLENCE

by Bill Machrone and Michael J. Miller

The personal computer industry has always been defined by technical achievement. In the ten years since IBM introduced its PC (and, shortly afterward, *PC Magazine* was founded), we've seen advances that have been nothing less than startling. Today's standard machines are 20 to 30 times as fast as those of ten years ago. Where once we had 160K floppy disks to store our programs and files, 300MB hard disks are becoming commonplace. There was a time when 64K of memory seemed enough, whereas we now confront applications and environments that require multiple megabytes of memory. And while we used to be content with the C:\> prompt, we now want environments with multiple windows, pull-down menus, and fancy graphics.

These advances did not come overnight; they came as a series of small technical innovations in a continuing process that shows no signs of slowing down. To recognize the people who have made these important technical contributions to advance the industry, *PC Magazine* has given awards for technical excellence since 1984. The awards acknowledge the work of the engineers, programmers, and business leaders whose creativity and energy have driven the industry.

For our Eighth Annual Awards for Technical Excellence,



a panel of *PC Magazine* editors and contributors spent many hours debating the merits of dozens of worthy contenders before settling on winners and finalists for this year. To be eligible for the 1991 Awards for Technical Excellence—which were presented at Fall Comdex 1991, the computer industry's largest trade show—products had to have shipped between October 1990 and September 1991. One exception is the category of operating systems and standards, where we accepted developers' kits that adequately showed off new features, since those products must go to developers before end users see the results.

Many of this year's winners and finalists show the importance of both innovation and persistence. Some break entirely new ground; others take existing ideas and improve on them, resulting in products that are faster, more powerful, or often just easier to use. We were looking for technical breakthroughs, and that limited the competition in many ways. While traditional desktop computers certainly got faster in 1991 (and we saw a lot of good products), no single machine stood out. In areas such as portable computers, printers, and software, there were many, many candidates. Narrowing the field to just a few finalists was a difficult task. In all cases, we found a surprising amount of technical achievement, and winners and finalists alike deserve recognition for their efforts in advancing the technical state of the art.



Standards and Operating Systems

There was more talk about operating systems in 1991 than in any other year since the PC revolution started. IBM put its stakes on OS/2 2.0, Microsoft decided the future was called NT, and IBM and Apple joined their formidable resources around "Pink." While we wait for all of these products to become realities, we have seen some real breakthroughs. They are important signposts of the new ways in which we will use computers in 1992 and beyond.



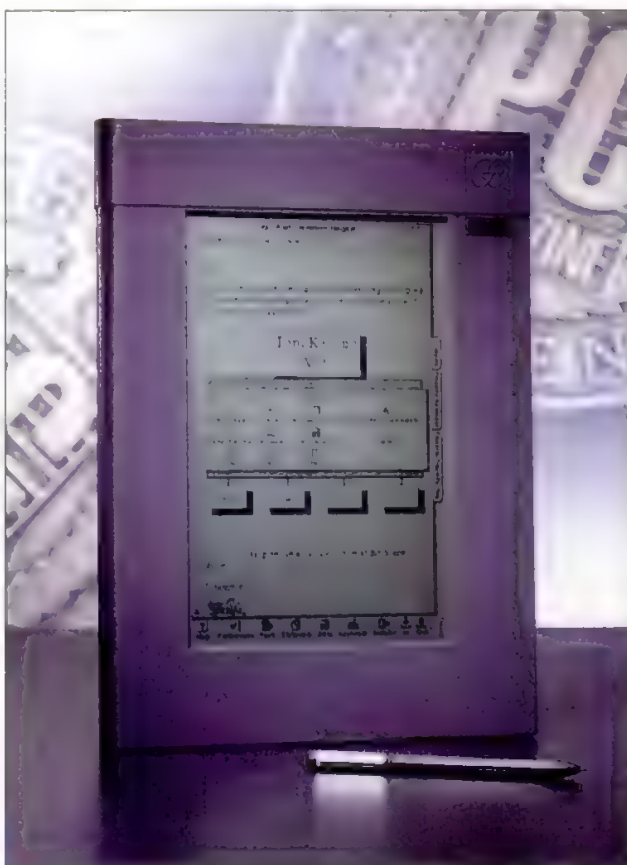
W I N N E R

PENPOINT

Robert Carr and the PenPoint Development Team

GO Corp. has deservedly received a lot of attention for its PenPoint operating system, the first major system we have seen that was built from the ground up to use a stylus rather than a mouse or a keyboard. With such features as handwriting translation, shape recognition, and gestures (pen movements) that perform common tasks such as inserting and deleting characters, PenPoint promises an entirely new kind of machine and application. But PenPoint offers developers more than just the use of pens. It is also a true 32-bit, flat memory model architecture designed specifically for the Intel 386, with built-in features such as embedded documents, connectivity, and hyperlinks between applications. The developers' kit lays the groundwork for a new way of computing, and we expect to see machines with the final operating system shortly.

GO Corp. ■ 950 Tower Ln. ■ 14th Floor
Foster City, CA 94404 ■ 415-358-2000



F I N A L I S T S

Macintosh System Software, Version 7.0

*Sheila Brady, Gifford Calenda,
Steve Goldberg, Roger Heinen*

Those of us in the world of the DOS environment are still waiting for the operating system of the 1990s, but in 1991, Apple Computer delivered to Macintosh users a mainstream operating system with a 32-bit address space and the TrueType outline font technology. Other changes in this long-awaited upgrade to the Macintosh operating system include some ease-of-use enhancements, such as Balloon Help. Perhaps the most intriguing innovation of Version 7.0 is Publish and Subscribe, an effective way of linking documents on a single machine as well as over a network, increasingly important as the Mac goes mainstream.

Apple Computer Inc. ■ 20525 Mariani Ave.
Cupertino, CA 95014 ■ 408-996-1010

Guidelines
For Safe
Shopping In
The Wilds
Of The
Computer
Industry.



"You've got a friend in the business."

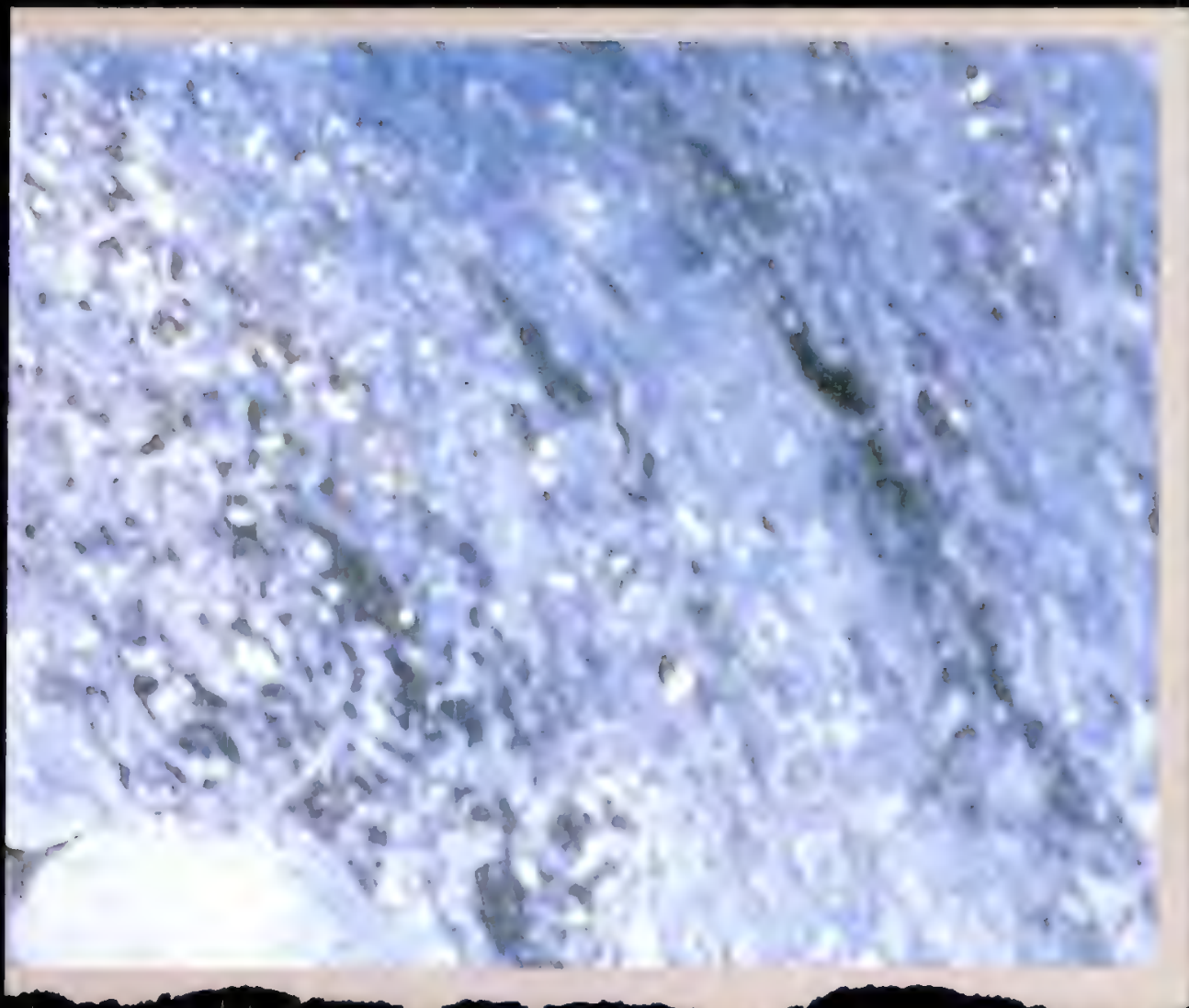
Don't Fall Prey



The computer industry is a treacherous wilderness of sorts. In it you'll find dense thickets of confusing jargon. Swamps of advertising claims laced with quicksand to suck you in. And hungry predators hunting for prey. To prevent you from becoming a delicious lunch for one of them, we've prepared the Gateway 2000 pictorial survival guide for shopping in this wild kingdom.

Guideline #1 – Don't fall prey to high prices. A number of PC manufacturers would have you believe a computer

To High Prices.



with their brand name is worth hundreds, even thousands of extra dollars. Is there intrinsic value in a name? The wily wilderness shopper knows that real value is a combination of features, performance, quality, service, company stability and price. The system that compares favorably in all of these categories is the best buy.

As you might expect, we think Gateway 2000 offers the best buy on the market. But don't take our word for it. Do the comparisons and see for yourself.



GATEWAY2000

"You've got a friend in the business."

Beware Of Those Who Would



Guideline #2 – Beware of those who would turn their backs on you. We've been in this industry for six years and we've seen a lot of PC manufacturers come and go. In the direct market channel, starting a business is easy. Staying in business is not. It's survival of the fittest, and the only companies that grow and prosper are those with an abiding commitment to quality and service and the financial strength to back it.

In the wilds of the computer industry, the savvy shopper studies the company as closely as the product. Is the company strong and successful? What do customers say about the company's commitment to quality and service?

With annual revenues in excess of \$600 million and an enviable balance sheet, Gateway's strength is indisputable.

Turn Their Backs On You.



Our success is demonstrated monthly when we ship over 25,000 Gateway systems to individuals and corporations.

Concerning the quality and service questions, we're feeling a little left out. J. D. Power and DataQuest did not include Gateway in their recent, highly touted surveys. In surveys which include Gateway, we consistently rank at or near the top. We're proud of our service record, but not satisfied. That's why we continuously invest in people, training and equipment to serve you better. The quest for improvement is a never-ending journey at Gateway 2000.



GATEWAY2000

"You've got a friend in the business."

Just Relax And



Guideline #3 – If you don't want to worry about guidelines #1 and #2, just get a Gateway and you can relax.

Gateway 2000 holds a unique position in the wilds of the computer industry. The industry giants with their inflated prices live high on a mountain. At the foot of the mountain is the valley of the clone-makers where prices are great but quality and service are sometimes questionable and business is shaky. The outstanding little companies quickly grow and move up on the mountain where they raise their prices. This is the pattern of nature in the industry.

Get A Gateway!



But Gateway 2000 lives all alone on a ridge at the base of the mountain overlooking the valley. You see, Gateway was one of the outstanding little companies that quickly grew – but refused to move up on the mountain. Our solitary outpost on the ridge allows us to give you the best of both worlds: mountain quality, service and stability at valley prices.

In the wilderness of the computer industry, take refuge in the simple value you get from Gateway 2000.



"You've got a friend in the business."

GATEWAY 2000 SYSTEMS

16MHZ 286

- 80286 Processor
- 2 MB RAM
- 1.2 MB 5.25" Drive
- 1.44 MB 3.5" Drive
- 40 MB 17ms IDE Drive with 32K Cache
- 16-Bit VGA with 512K
- 14" Crystal Scan 1024 Color VGA Monitor
- 1 Parallel/2 Serial Ports
- 1 PS/2 Mouse Port
- 124-Key AnyKey™ Keyboard
- MS DOS® 5.0

\$1345

16MHZ 386SX

- Intel® 80386SX Processor
- 2 MB RAM
- 1.2 MB 5.25" Drive
- 1.44 MB 3.5" Drive
- 40 MB 17ms IDE Drive with 32K Cache
- 16-Bit VGA with 512K
- 14" Crystal Scan 1024 Color VGA Monitor
- 1 Parallel/2 Serial Ports
- 1 PS/2 Mouse Port
- 124-Key AnyKey Keyboard
- Microsoft® Mouse
- MS DOS 5.0
- MS Windows™ 3.0

\$1445

20MHZ 386SX

- Intel 80386SX Processor
- 32K Cache RAM
- 4 MB RAM
- 1.2 MB 5.25" Drive
- 1.44 MB 3.5" Drive
- 80 MB 17ms IDE Drive with 32K Cache
- 16-Bit VGA with 512K
- 14" Crystal Scan 1024 Color VGA Monitor
- 1 Parallel/2 Serial Ports
- 1 PS/2 Mouse Port
- 124-Key AnyKey Keyboard
- Microsoft Mouse
- MS DOS 5.0
- MS Windows 3.0

\$1745

25MHZ 386

- Intel 80386 Processor
- 4 MB RAM
- 1.2 MB 5.25" Drive
- 1.44 MB 3.5" Drive
- 80 MB 17ms IDE Drive with 32K Cache
- 16-Bit VGA with 1 MB
- 14" Crystal Scan 1024NI Color VGA Monitor
- 1 Parallel/2 Serial Ports
- 124-Key AnyKey Keyboard
- Microsoft Mouse
- MS DOS 5.0
- MS Windows 3.0

\$1945

33MHZ 386

- Intel 80386 Processor
- 64K Cache RAM
- 4 MB RAM
- 1.2 MB 5.25" Drive
- 1.44 MB 3.5" Drive
- 200 MB 15ms IDE Drive with 64K Multi-Segmented Cache
- 16-Bit VGA with 1 MB
- 14" Crystal Scan 1024NI Color VGA Monitor
- 1 Parallel/2 Serial Ports
- 124-Key AnyKey Keyboard
- Microsoft Mouse
- MS DOS 5.0
- MS Windows 3.0

\$2445

BEST BUYS

- Get our 33 MHz 386 system, same configuration as listed, with a 120 MB IDE hard drive instead of the 200 MB drive. **\$2195**
- Same features as our 33 MHz 486 system except this machine has 4 MB RAM, instead of 8, and a 120 MB IDE hard drive, instead of the 200 MB drive in our standard configuration. **\$2545**

33MHZ 486

- Intel 80486 Processor
- 64K Cache RAM
- 8 MB RAM, Expands to 64 MB
- 1.2 MB 5.25" Drive
- 1.44 MB 3.5" Drive
- 200 MB 15ms IDE Drive with 64K Multi-Segmented Cache
- 16-Bit VGA with 1 MB
- 14" Crystal Scan 1024NI Color VGA Monitor
- 1 Parallel/2 Serial Ports
- 124-Key AnyKey Keyboard
- Microsoft Mouse
- MS DOS 5.0
- MS Windows 3.0

\$2995

33MHZ 486 EISA

- Intel 80486 Processor
- 128K Cache RAM
- 8 MB RAM, Expands to 64 MB
- 1.2 MB 5.25" Drive
- 1.44 MB 3.5" Drive
- 340 MB 15ms SCSI Drive with 128K Multi-Segmented Cache
- 32-Bit EISA SCSI Controller
- 16-Bit VGA with 1 MB
- 14" Crystal Scan 1024NI Color VGA Monitor
- 1 Parallel/2 Serial Ports
- 124-Key AnyKey Keyboard
- Microsoft Mouse
- MS DOS 5.0
- MS Windows 3.0

\$3895

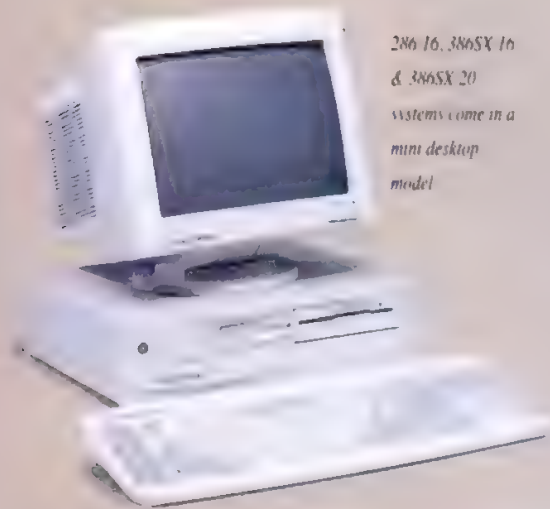


All prices are subject to change. Prices do not include shipping. Printed on recycled paper. Corporate Sponsor of Global Releaf – a program of the American Forestry Association, Box 2000, Washington, DC 20013. Call us for information on how you can support Global Releaf.



8 0 0 - 5 2 3 - 2 0 0 0
610 Gateway Drive • N. Sioux City, SD 57049 • 605-232-2000 • Fax 605-232-2023

GATEWAY 2000'S SANCTUARY OF VALUE



286 16, 386SX 16
& 386SX 20
systems come in a
mini desktop
model

Mini Desktop Systems

Our 286 and 386SX systems come in a compact, mini desktop model that's just 4.25 inches high, 16.25 inches wide and 16 inches deep. These systems feature a custom-designed, integrated motherboard to create a more reliable system. To give you plenty of room for expansion in a small footprint computer, we integrated the diskette drive controller, the video chip set and the I/O card on the motherboard, leaving five 16-bit slots open in the standard configuration. The mini desktop models also have a standard mouse port (PS/2 compatible), leaving two serial ports open.

Desktop Systems

Standard configurations for Gateway's 386 and 486 systems include all the features you want for optimum performance with the latest software. You don't have to study our configurations to figure out what's missing. All systems have plenty of RAM, two diskette drives, high capacity, fast and reliable hard drives, super fast 16-bit VGA graphics with 1 MB RAM and 1024 x 768 non-interlaced color monitors. It's all there - for an unbelievably good price. 386DX and 486 systems come standard in a desktop model. Our tower model with a 220 watt power supply is available as an option for an additional \$100.

New 33 MHz 486 EISA

If you've been waiting for an affordable EISA system, your wait is over. With a 340 MB SCSI drive and 32-bit EISA SCSI controller, Gateway's 33 MHz 486 EISA system is incredibly priced at only \$3895.

Peripherals

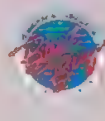
We sell and support a complete line of competitively priced, quality name-brand peripherals, including laser and dot matrix printers, modems, tape backups and coprocessors. Sorry - we sell peripherals and components only with the purchase of a system, or separately only to owners of Gateway 2000 systems.

The Extras - That Don't Cost Extra At Gateway

- One-year warranty on parts and labor
- Replacement parts shipped quickly via overnight shipping at no charge
- 30-day money-back guarantee
- Lifetime toll-free technical support from the service organization that won PC World's Service Excellence Award
- Free on-site service to most locations
- Free bulletin board technical support
- C.O.D. terms and major credit cards honored
- Net 30-day credit terms and leasing options available to qualified commercial customers
- MS DOS 5.0 is standard; versions 4.01 and 3.3 are available at no extra charge
- The programmable AnyKey keyboard is standard; a 101-key keyboard is also available at no extra charge
- Software diskettes and comprehensive hardware and software manuals provided
- Canadian customers - our 800 number is toll-free from Canada and systems (excluding monitors and keyboards) are now duty-free! 

Sales Hours: 7am-10pm Weekdays, 9am-4pm Saturdays (Central Time)

Service Hours: 6am-Midnight Weekdays, 9am-2pm Saturdays (Central Time)





Microsoft Windows for Pen Computing

Byron Bishop, Markin Eller, Lloyd Frink,
Greg Slyngstad

While PenPoint is basically a new operating system, *Windows for Pen Computing*, or *Pen Windows* as it has been dubbed, proves that you can add many of the benefits of pen-based computing to an existing operating system—in this case, Microsoft's supersuccessful *Windows*. In *Pen Windows*, you not only get features such as the use of a pen for pull-down menus, gestures that tell the system what to do, and drawing tools, you also get compatibility with the hundreds of existing *Windows* applications. And when applications are written that take advantage of *Pen Windows*, they will be able to add more functions specific to the use of a stylus, such as handwriting recognition and annotation. *Pen Windows* offers the promise of combining many of the best elements of pen-based computing with existing standards.

Microsoft Corp. ■ One Microsoft Way
Redmond, WA 98052-6399 ■ 206-882-8080

MS-DOS, Version 5.0

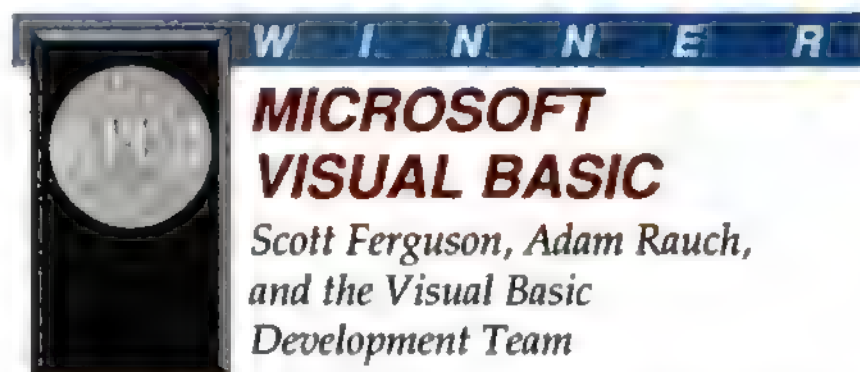
Mike Dryfoos, Tom Lennon,
Brad Silverberg, Eric Straub

This new DOS version gave many of us our first compelling reasons to upgrade in years. With many of its features available in competing products, no one can deny their usefulness. The new options include the ability to load programs and drivers into high memory (including parts of DOS itself), a rudimentary task switcher, a useful shell, and file recovery utilities. Despite these features, this is the first new version of DOS to take up less memory than its predecessor: Users can gain as much as 60K for applications. Technical innovation is equally evident in Version 5.0's new features and its compatibility—its ability to look like previous versions, and the ease of upgrading your existing operating system.

Microsoft Corp. ■ One Microsoft Way
Redmond, WA 98052-6399 ■ 206-882-8080

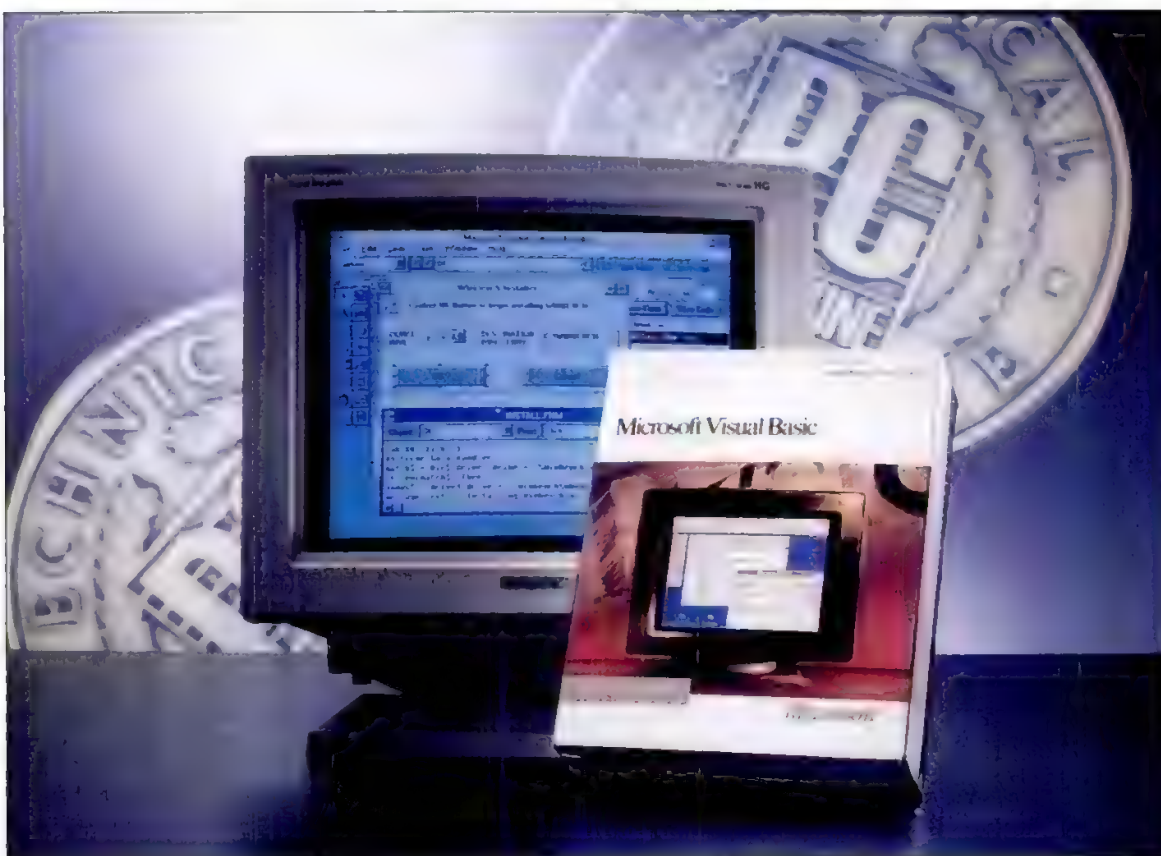
Development Tools

Development tools are the building blocks of computer software. But if their mission has always been simple, using them has not. This has caused a huge backup in much-needed software applications. The finalists for 1991 could help break the logjam. They epitomize the trend toward easy-to-use graphics products that place software developers inside the environments for which they are writing.



Microsoft Visual Basic makes programming in *Windows* easy. It brings custom programs, utilities, and shells within the reach of every user. The colorful dialog boxes, controls, and display panels are all very much in keeping with the graphical user interface and provide a degree of interactivity formerly denied both the advanced user and the casual developer. Aside from helping programmers get over the hump of thinking in event-driven terms, Visual Basic requires a lower investment than any other programming language and gives a very high return per line of code invested. While it is not object-oriented in the strict sense of the term, Visual Basic is a huge step in the right direction. It brings *Windows* programming to the average user, promising a new wave of do-it-yourself software. We waited years for Visual Basic, and it was well worth the wait.

Microsoft Corp. ■ One Microsoft Way
Redmond, WA 98052-6399 ■ 206-882-8080



F I N A L I S T S

Turbo Pascal for Windows

*The Turbo Pascal for Windows
Development Team*

Turbo Pascal single-handedly saved Pascal from the genteel oblivion of being a mere teaching language. Turbo Pascal's latest incarnation as a development environment for *Windows* is remarkably complete, though not completely GUI-based. Even so, the compromises are few and the benefits many. Turbo Pascal avoids the costs and complexities of the *Microsoft Windows Software Development Kit* and is thus a boon to the small developer and the software publisher wishing to port existing Turbo Pascal applications to *Windows* at minimal cost. The Object *Windows Library* is impressively complete, a rich collection of classes and objects that ensure full use of *Windows* and object-oriented programming.

Borland International Inc. ■ 1800 Green Hills Rd.
Scotts Valley, CA 95066 ■ 408-438-8400

Realizer

*Steven A. Cohn, Michael I. Hyman,
Terry L. Lucas, Peter J. Maruhn*

Realizer is a bold stroke in development software. It gives the user a simple BASIC syntax, with powerful extensions. The program's extensive libraries include routines for communications, printing, charting, and animation. A robust development tool with a straightforward and powerful debugger, Realizer is the perfect solution for the causal programmer, too. It fully utilizes the *Windows* environment and interface, but its procedural approach is easier for traditional programmers to comprehend. Realizer has its flaws, but its power and the ability to do so much make you want to overlook them. Realizer is a compiler and an interpreter; in the latter mode, it is the ideal way to explore *Windows'* features.

Within Technologies ■ Laurel Corporate Center
#201 South ■ 8000 Midlantic Dr.
Mount Laurel, NJ 08054-5080 ■ 609-273-8881

Insight

Insight has the experts raving.

"Insight delivers exceptional value at an exceptional price." - *PC Computing*. **HOW LOW CAN OUR PRICES GO?** Complete

computer systems from \$995. **COMMAND PERFORMANCE**

"You can finally cure that raging hunger for computing muscle."

- *Computer Shopper*. Insight systems are high-powered, low-cost, dependable workhorses that give you the stellar performance you demand. **3, 2, 1... BLASTOFF!!**

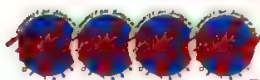
"... too fast to verify with benchmark tests." - *PC Sources* on the Insight 486-33 EISA.

IF IT'S QUALITY YOU CRAVE You shall receive. "Quality products/reasonable prices"

- *Computer Shopper*. Insight sets the pace in reliability and service with features beyond what you'd expect to find as standard. We've teamed up with our sister company

HARD DRIVES
International

Hard Drives International to save you money! HDI has captured *Computer Shopper's* "Best Buy."



for 4 years running, and *PC Magazine's* coveted "Editor's Choice" for Mass

Storage. **UNPARALLELED SPECS** Insight systems boast a long list of brand name



components, meticulously fine tuned with the strictest quality control. Insight is *not* too good to be true.

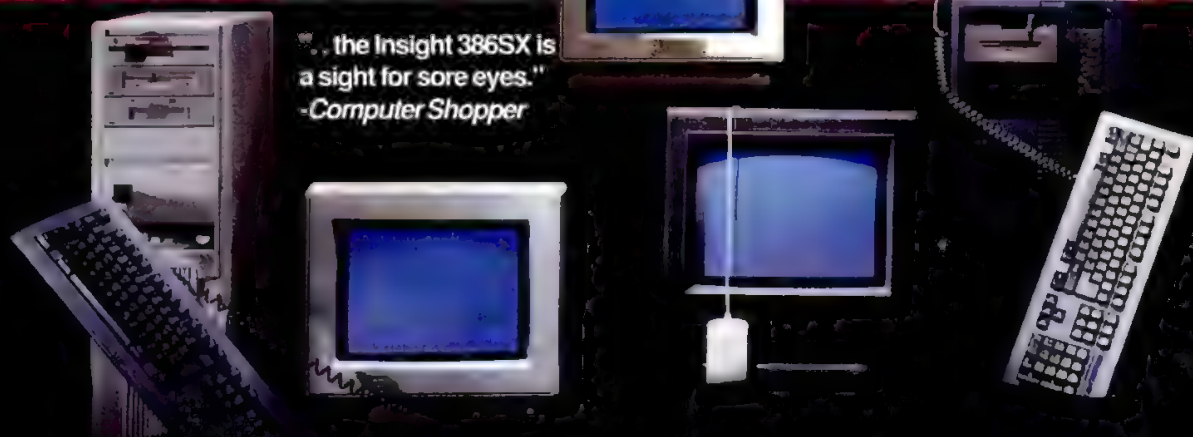
GET INSIGHT INTO YOUR FUTURE Our 30 day Worry-Free Guarantee assures you have nothing to lose. Talk to one of our friendly, experienced salespeople about owning an Insight System -today!

Insight

800-927-3161



"... the Insight 386SX is
a sight for sore eyes."
- *Computer Shopper*




386SX-20Mhz \$1595
Standard Configuration

- 4Mb of RAM
- 80Mb 17ms Caching IDE Hard Drive
- NON-INTERLACED 14" SVGA 1024x768 Color Monitor
- 16 Bit 1Mb Super VGA Card
- Both 1.2 & 1.44Mb Floppy Drives
- 2 Serial Ports, 1 Parallel Port
- Enhanced 101 Key Keyboard
- MS DOS

Add \$199 for 210Mb Hard Drive
386-25Mhz \$1695
Includes Standard Configuration Substitutes

- 130Mb 17ms Caching IDE Hard Drive

386-33 Cache \$1895
Includes Standard Configuration Substitutes

- 130Mb 17ms Caching IDE Hard Drive

Plus

- 64K RAM Cache

386SX-20Notebook \$1795

- 8.2"x11.7"x1.8" • Under 7 pounds
- 2Mb of RAM (expandable to 5Mb)
- 1.44Mb 3.5" Floppy Drive
- 60Mb 23ms IDE Hard Drive
- 10" backlit 16 level LCD grey scale VGA display
- 83 Key Keyboard (101 key emulation)
- NiCad battery pack
- AC Adaptor/recharger
- 2 Serial Ports, 1 Parallel Port
- External VGA port
- External keyboard port
- MS DOS

\$1495 for 20Mb Hard Drive
486-SXCache \$1995
486-33Cache \$2295

- 4Mb of RAM
- 64K RAM Cache
- 130Mb 15ms Caching IDE Hard Drive
- NON-INTERLACED 14" SVGA 1024x768 Color Monitor
- 16 Bit 1Mb Super VGA Card
- 1.2Mb 5.25" Floppy Drive
- 1.44Mb 3.5" Floppy Drive
- 2 Serial Ports, 1 Parallel Port
- Enhanced 101 Key Keyboard
- MS DOS

Add \$199 for 210Mb Hard Drive
486-33 EISACache \$9995

- 16Mb of RAM
- 1 Gig 14ms SCSI Hard Drive
- 32bit Caching Controller, 2-8Mb RAM
- 64K RAM Cache
- Internal 600Mb CD-ROM Drive
- 1.3 Gig Dat Tape Backup
- NON-INTERLACED 14" SVGA 1024x768 Color Monitor
- 16 Bit 1Mb Super VGA Card
- 1.2 & 1.44Mb Floppy Drives
- 2 Serial Ports, 1 Parallel Port
- Enhanced 101 Key Keyboard
- MS DOS


 MICROSOFT
WINDOWS
just

\$49*

Insight Computers
Insight Distribution Network, Inc.
1912 W. 4th St., Tempe, AZ 85281
Nat'l Accounts: 800/927-3194
Fax 602-350-1182
602-350-1176

* Prices and availability subject to change without notice. P.O.'s accepted from qualified buyers-Net 20 (some conditions may apply.) 30 Day Guarantee, 1 Year Replacement Policy may have some restrictions. 30-Day Guarantee not available on lease purchases. The Intel Inside Logo is a trademark of Intel Corporation. All trademarks and trade-names herein are the properties of their respective owners. Corporate lease rates based upon a 36 month fair market value lease plus applicable sales tax. Two month advance deposit required. Individual lease rates will vary 12/31/91


Insight
800-927-3161

"(The) 386SX system we'd most like to be seen with in public."
-Computer Shopper





Utilities

The introduction of *Windows* and DOS 5.0 may have changed what we need from utilities, but we still need them. Moving files, launching applications, and making text look better can be harder than they should be. Developers came up with some great new tools that made working in new environments even better.



W I N N E R

STACKER, VERSION 1.1

Bob Monsour, Doug Whiting,
and the Stacker Development Team

Stacker gives many PC users what they have always wanted: a larger hard disk. And it does this without changing your machine at all. Instead, *Stacker* is a software utility whose on-the-fly data compression effectively doubles your hard disk space by compressing both your programs and your data files on-disk, and expanding those programs into memory when you use them. While Stac Electronics offers a version that includes a board with a special chip that speeds up this compression, the software-only version has caught our fancy, as it fits just about anywhere—including on notebook computers. With programs gobbling up disk space, *Stacker* can be a lifesaver. Compared with other compression programs, *Stacker* shines for its relatively small memory hit (about 30K) and its compatibility with almost all hard disks and software—including your favorite disk utilities and defragmenters. An updated version, *Stacker* 2.0, began shipping in October.

Stac Electronics ■ 5993 Avenida Encina
Carlsbad, CA 92008 ■ 619-431-7474



F I N A L I S T S

Adobe Type Manager for Windows

Ramin Betash, Tom Malloy, Ivar Michelsons,
Ning-Ju Nan, Bob Wulff

The need for outline fonts, both on-screen and in the printer, should be clear to anyone who has ever seen the dreaded jaggies on-screen or installed a graphics program with 50MB of fonts. *Adobe Type Manager for Windows* solves many of these problems through its quick font rendering, extensive font library, and good *Windows* compatibility. The \$99 package comes with 13 popular typefaces that effectively turn any printer into a PostScript device. *ATM for Windows* has been adopted as the standard for such applications as *Aldus Persuasion*, *Ami Pro*, *PageMaker*, and *1-2-3 for Windows*.

Adobe Systems Inc. ■ 1585 Charleston Rd.
P.O. Box 7900 ■ Mountain View, CA
94039-7900 ■ 415-961-4400

LOOK HOW MUCH WE WON IN LAS VEGAS.

At the recent Comdex Show in Las Vegas, our T2200SX won two of the most prestigious awards a computer can receive. PC Magazine's Technical Excellence Award for best portable computer, an award bestowed to new products that are the most technologically innovative.

And PC/Computing's MVP Award for one of the products that best allows

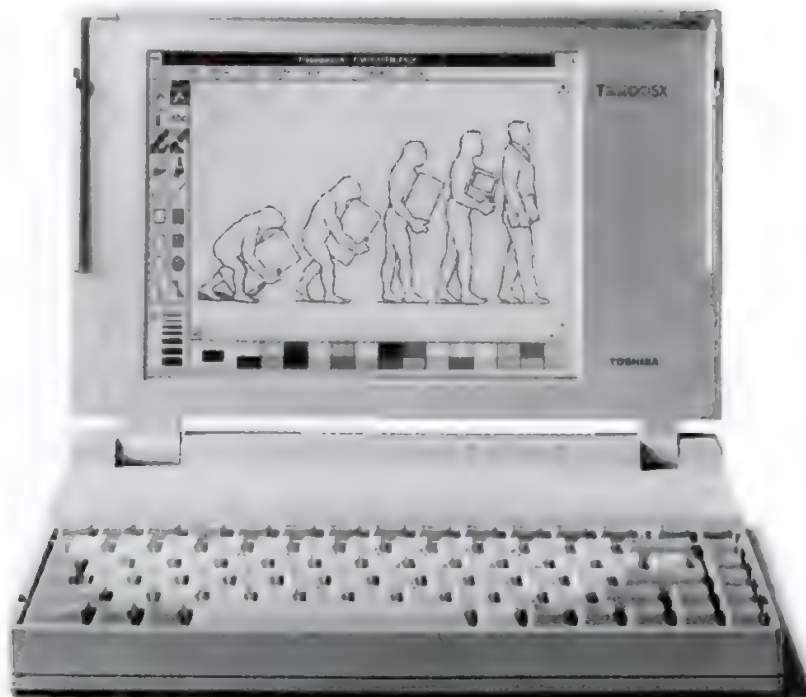


users to benefit from innovative technology.

Which just goes to prove what we've been saying all along: Why gamble on just any notebook computer when Toshiba offers you a sure thing?

For more information on the extraordinary T2200SX, call us at 1-800-457-7777.

In Touch with Tomorrow
TOSHIBA



PC Magazine Technical Excellence Logo and PC/Computing MVP Logo Copyright © 1991, Ziff Communications Company. PC Magazine and PC/Computing are registered trademarks and the PC Magazine Technical Excellence Logo and the PC/Computing MVP Logo are trademarks of Ziff-Davis Publishing Company. © 1991 Toshiba America Information Systems, Inc.

CIRCLE 168 ON READER SERVICE CARD



Norton Desktop for Windows

Linda Dudinyak, David Hertel, Mark Lawler,
Bruce McCorkendale, Michael Russell,
Enrique Salem

Norton Desktop for Windows has redefined our expectations of a utility package for *Windows*. As you would expect, *NDW* includes *Windows* versions of popular Norton utilities, including an unerase utility, the indispensable Disk Doctor, a system information utility, and a *Windows*-based backup program. But Symantec Corp. breaks new ground with the Desktop, which combines the functions of *Windows*' Program Manager and File Manager into a new and improved visual shell. *NDW* lets you find and view files, launch programs, and change icons easily, and you can print and erase files without leaving the Desktop. In addition, the program includes its own menu choices and a full-fledged batch language to create more menu items. Despite its many utilities and options, *Norton Desktop for Windows*' ease of use is what really makes the package stand out.

Symantec Corp. ■ 10201 Torre Ave.
Cupertino, CA 95014-2132 ■ 408-253-9600

QEMM-386, Version 6.0

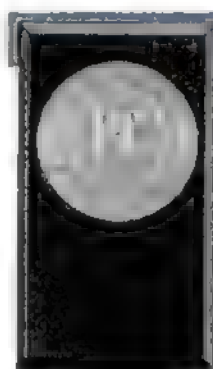
Steve Goodrich, Larry Mayer, Dan Spear

We seem to expect Quarterdeck Office Systems to lead the way in discovering more and more memory in our machines. This time around, the developers have come up with a technology they call "Stealth," which relocates the memory taken up by a PC's ROM code and makes that memory usable as high RAM. Other changes in this version of the package include an improved Optimize command that makes it simpler to figure out the best memory configuration for your system, and improved compatibility with the Suspend and Resume features common to many laptops. Users routinely report getting an additional 30K to 60K of DOS space to run their applications—elbow room that can often make a big difference.

Quarterdeck Office Systems Inc. ■ 1901 Main St.
Santa Monica, CA 90405 ■ 213-392-9851

Applications Software

We have seen a lot of programs move to *Microsoft Windows* in 1991, and many applications with features piled on top of more features. But the best programs on any platform were those that not only offered new functionality but made everyday tasks faster and easier.



W I N N E R

FOXPRO, VERSION 2.0

David Fulton and the FoxPro
Development Team

Fox Software has always been known for a fast database, but *FoxPro* 2.0 is in another league altogether. Using a new query optimization technology called Rushmore, *FoxPro* 2.0 was able to perform some of our benchmark tests hundreds of times as fast as its competitors. While it was not that much faster on other benchmark tests, *FoxPro* 2.0 still offers blazing performance in single-user database access. In addition, this release includes new features such as Relational Query by Example, integrated SQL select statements, and a simple but powerful new screen builder.

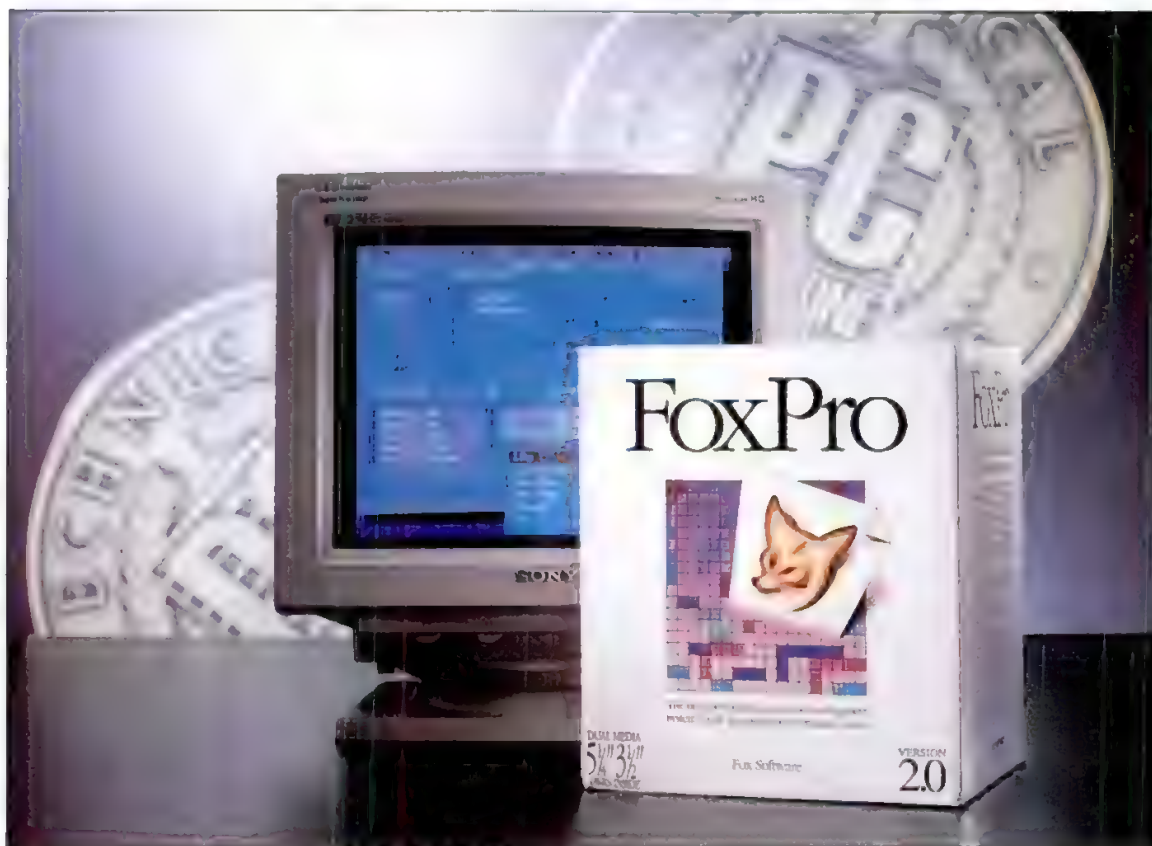
Fox Software Inc. ■ 134 W. South Boundary
Perrysburg, OH 43551 ■ 419-874-0162

F I N A L I S T S

Aldus Persuasion, Version 2.0 for Windows

Marc Browning, Ron Sauers

In adapting its powerful presentation graphics package *Persuasion* from the Macintosh to *Windows*, Aldus Corp. introduced several concepts that showed the program to be more than a port from a niche platform to the mainstream. The DOS version brought a new



level of power to the creation of slides and overheads. New features include related notes pages and handouts. *Persuasion 2.0* offers an integrated outline processor, automatic slide layout, charting and graphics tools, and AutoTemplates that include multiple related masters—all within an interface that takes its cue from Aldus's DTP powerhouse, *PageMaker*.

Aldus Corp. ■ 411 First Ave. South
Seattle, WA 98104-2871 ■ 206-628-2320

Ami Pro, Version 2.0

Joel Gutheridge and the Ami Pro
Development Team

In the very competitive *Windows* word processing market, Lotus released *Ami Pro* in its second version while some others were still working on their first effort. *Ami Pro 2.0* brought several innovations to *Windows* word processing, including SmartIcons, which let you assign your most frequently used commands and macros to icons and place them where

you want them. New features include an equations editor and integrated drawing, charting, and image-processing tools. You can now edit drawings and charts in place on-screen. The new version lets you incorporate macro-language statements into your document and create automatic documents, which can ask you to fill in information when they are run.

Lotus Development Corp. ■ Word Processing
Division ■ 5600 Glenridge Dr. ■ Atlanta, GA 30342-
1334 ■ 404-851-0007

Autodesk 3D Studio

Bob Bennett, Tom Hudson, Jack Powell,
Dan Silva, Gary Yost

This package integrates three-dimensional modeling, rendering, and animation capabilities into a single package for the professional artist or designer. You can create new 3-D models or import them from *AutoCAD*, use a vast library of materials to make sure colors and shadings look realistic, perform a high-



quality rendering of the object, and then animate the image, creating spectacular results.

Autodesk Inc. ■ 2320 Marinship Way
Sausalito, CA 94965 ■ 415-332-2344

Microsoft Excel, Version 3.0 for Windows

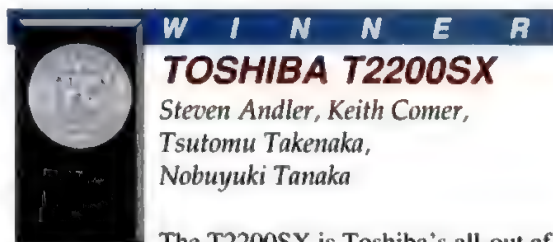
Jon DeVaan, Chris Graham, Chris Peters

Microsoft Excel 3.0 proved you could take a spreadsheet and make it a lot easier to use. The Toolbar, which lets you perform common functions by just clicking on an icon, has some unique functions. Particularly useful are an Autosum key, which lets you select a cell and figures out which numbers you want to add, and a new integrated outlining feature that lets you control the level of detail in your spreadsheet. The outliner is also tied to the program's powerful Spreadsheet Styles feature, making it easy to control the number format, alignment, borders, and font information for various parts of your worksheet.

Microsoft Corp. ■ One Microsoft Way
Redmond, WA 98052-6399 ■ 206-882-8080

Portable Computers

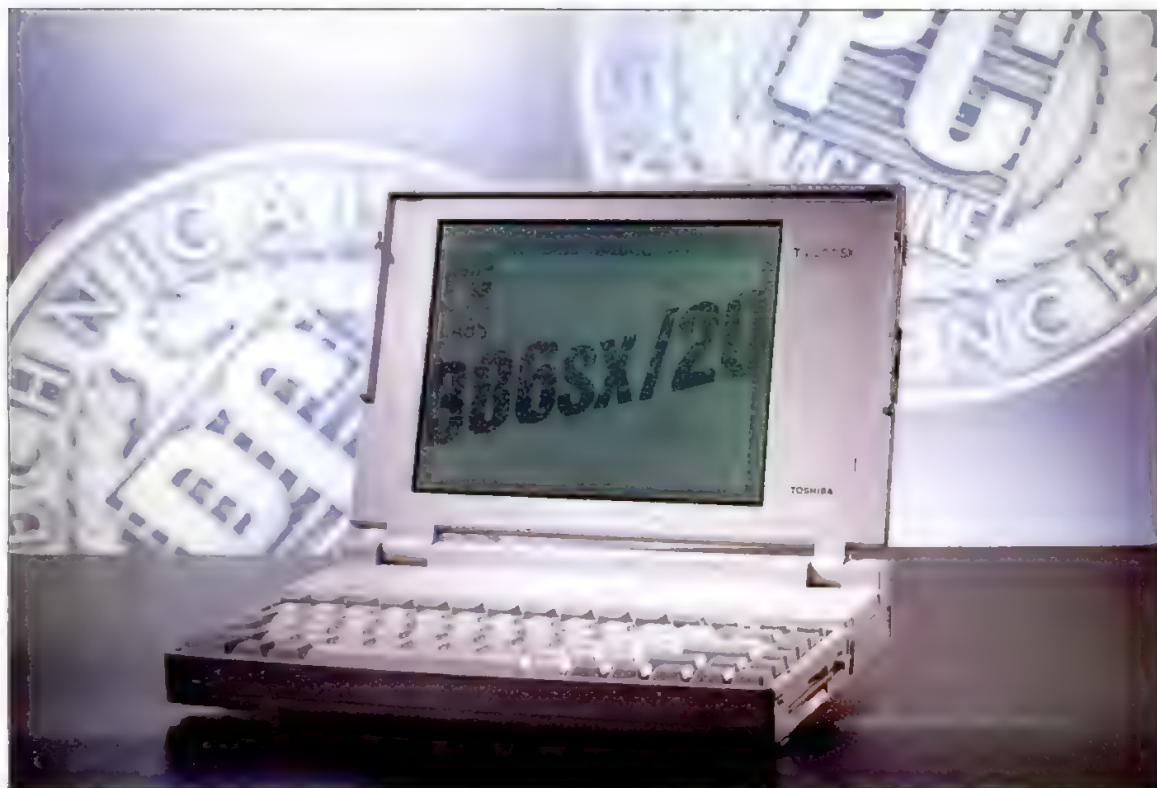
In our age, being away from your computer can cause withdrawal pains. Taking it with you can cause shoulder pains and eyestrain. This year's winners strike an elegant balance in the continuing struggle of power against weight, all conveniently on your lap—or in your palm.



TOSHIBA T2200SX

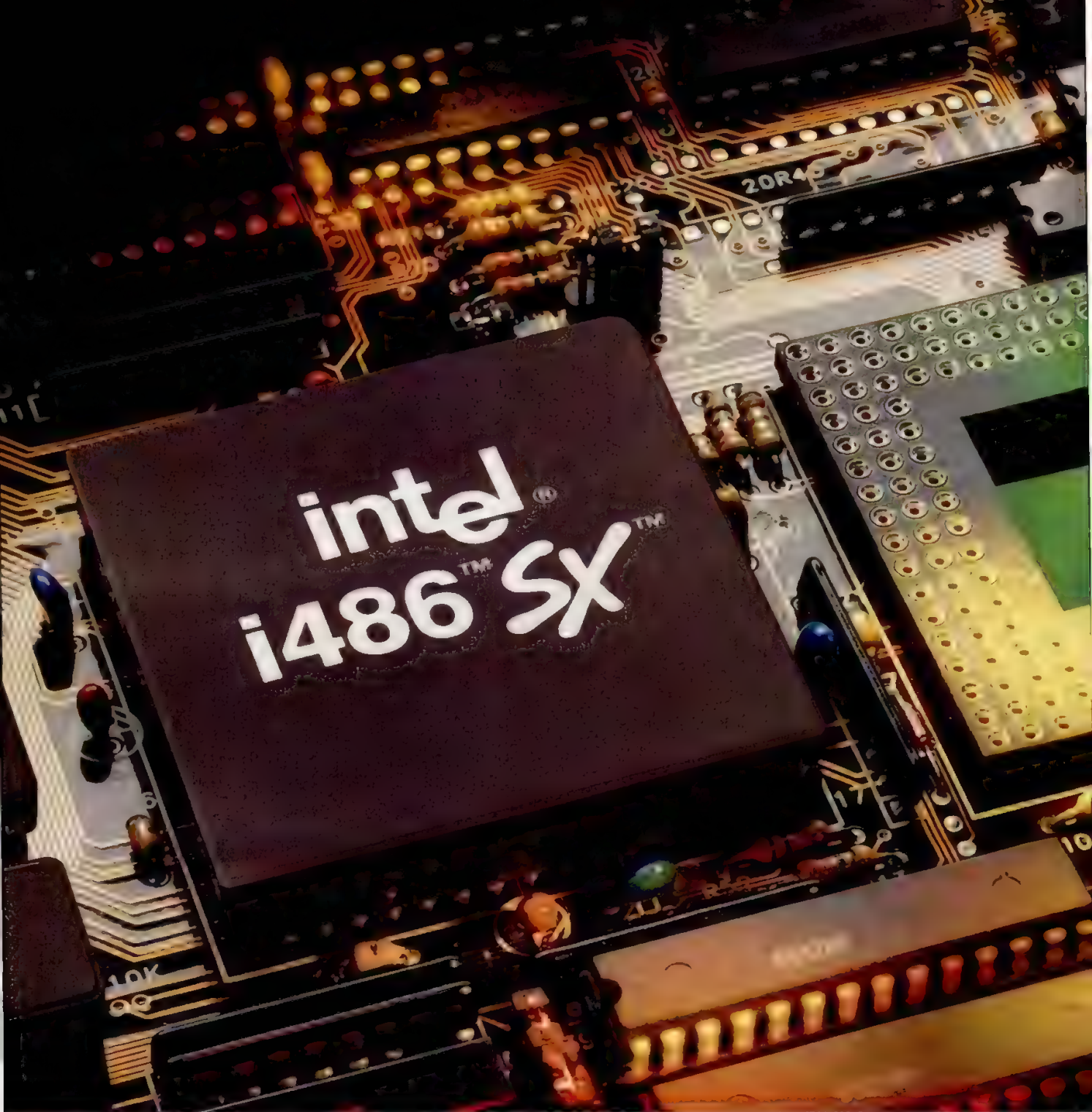
*Steven Andler, Keith Comer,
Tsutomu Takenaka,
Nobuyuki Tanaka*

The T2200SX is Toshiba's all-out effort to get back into the forefront of laptop development, and it has succeeded brilliantly. The new machine capitalizes on Toshiba's already excellent power-management systems, keyboard layout, and



Something's waiting
inside the
486TM SX computer.





Room for the future. Intro



Sure, the Intel486™ SX delivers workstation power at a 386 price today. But let's say you need more power down the road. No problem. Room will be waiting. Thanks to new built-in CPU upgradability.

Intel has developed an upgrade processor, due in 1992, that will plug into many 486 SX systems. With this simple addition, you'll double CPU performance. The net effect: an overall system performance boost of up to 70 percent—



roducing built-in upgradability.

across all applications. Plus, you'll get on-chip math capabilities.

So consult your dealer to see which 486SX systems are upgradable. Or call 1-800-722-7772 for a free, informative brochure.

And check into the computer with room for the future today.

intel®

The Computer Inside.™



overall ergonomics. It adds a bigger, brighter VGA display, state-of-the-art nickel hydride batteries, a 60MB hard disk, and a space-age carbon fiber-reinforced case, to weigh in at a mere 5.5 pounds. Toshiba has covered all the bases with this machine: ruggedness, extended battery life, auto-resume, expandability, and performance. To top it off, the charger is the smallest and lightest we have ever seen. This is the one to beat.

Toshiba America Information Systems ■ 9740 Irvine Blvd. ■ Irvine, CA 92718 ■ 800-334-3445

F I N A L I S T S

AT&T Safari NSX/20

Developed jointly by AT&T and Marubeni America Corp.

The Safari NSX/20 is one of the most original laptop computers we have seen this year. Its refreshing and unconventional design makes it especially worthy of our attention. The lime-green buttons, the cute little LCD status panel, and the soft retro curves meld art deco and high tech. This is tangible proof that all laptops need not look alike. But the Safari is more than a pretty face. It is a thoroughly usable machine that boasts the best battery life we have ever tested in a 386SX machine. AT&T Mail was well integrated into the first version, and a second round of offerings introduced the first pager-based messaging capabilities in a laptop. We applaud the innovation behind these skillfully merged technologies.

AT&T Safari Systems ■ Somerset, NJ 08875
908-302-5800

HP 95LX

Terry Bradley, Jerry Erickson, Eric Evett, Howard Honig, Tim Williams, and the HP 95LX Design Team

The HP 95LX is the smallest DOS palmtop computer. A brilliant conjoining of miniaturization, design, form, and function, it delivers unique capabilities in a pocket-size package. The combination of a personal information manager, an organizer, utilities, and

Lotus 1-2-3 make it a winner. The ability to run DOS programs puts it in a class by itself. It represents a perfect collaboration of HP's calculator designers, who have ruled the high end of that industry for 30 years, and real users of DOS-based PCs.

Hewlett-Packard Co. ■ Corvallis Division ■ 1000 NE Circle Blvd. ■ Corvallis, OR 97330 ■ 800-443-1254

Printers

Converting your work from electric charges stored in silicon to words and figures on paper continues to challenge the existing technology. This year's winners show that the aspect of computing most dependent on the smooth operation of mechanical devices remains a center of creative invention—and reinvention.



W I N N E R

**IBM
LASERPRINTER 10**

*Ron Bingham, Bill Branson,
Paul Curlander, Bill Kroeger*

IBM's decision to spin off its printer and typewriter business didn't stem the flow of innovation. The new IBM LaserPrinter 10 is the hottest single-user printer we have ever seen. Not only does it crank out great-looking pages at a healthy 10 pages per minute, it also offers some of the industry's highest graphics performance, with optional 600-dot-per-inch resolution and blazing speed. The price is competitive, too, with one of the lowest costs for adding PostScript of any printer on the market. Inside, this machine is a model of simplicity. Its clean design and low component count should make it a reliable performer for years to come. We especially like the



modularity of IBM's line of laser printers, with easy expansion from the bottom of the line to the top.

Lexmark International Inc. ■ 740 New Circle Rd.
Lexington, KY 40511 ■ 800-426-2468

F I N A L I S T S

Citizen PN48 Notebook Printer

David Ball and the Citizen Technical Staff

Citizen's PN48 raises the ante in portable printing. This cigarette carton-size machine weighs in at just 2 pounds and produces laser-quality output. Its 36-dpi print looks great, and it offers standard Epson and IBM emulations, albeit at a leisurely 1 ppm. We are impressed with Citizen's Thermal Fusion Technology, which combines the best aspects of dot matrix printing with thermal transfer and electrophotographic techniques. With battery power and silent operation, this is the perfect printer for the road.

Citizen America Corp. ■ 2450 Broadway
P.O. Box 4003 ■ Santa Monica, CA 90411-4003
213-453-0614

Tektronix Phaser III PXi

*Ron Adams, Steve Palmquist, and the Tektronix
Phaser III PXi Development Team*

Tektronix stays at the forefront of color desktop printing with its novel Phaser III PXi printer. Simple and complex at the same time, the Phaser III PXi solves the problem of drop-on-demand ink jet printing with none of the drawbacks of messy liquids. The crayonlike solid ink is the only consumable, and it is easily replaced. The printhead is an engineering marvel, with its myriad passages that warm the ink and channel it to the nozzles, where it flies across the brief space to the paper and becomes solid again. Everything about this newest Phaser is impressive: the speed, the quality, the under-\$10,000 price. And the color output is worth every penny: bright, smooth, and accurate. The first machine on the market with PostScript Level 2 support, the Phaser III PXi is a machine for today—and for tomorrow.

Tektronix Inc. ■ P.O. Box 1000
Wilsonville, OR 97070-1000 ■ 800-835-6100



Connectivity

Nearly half of computer users hook up to a network these days. But what may have become a corporate necessity is often a struggle against complexity and obscurity. In 1991, developers continued to apply their ingenuity to making LANs easier and more convenient to use.

W I N N E R

ALTair WIRELESS ETHERNET

Robert Cieslak, Thomas Freeburg,
Lee Hamilton, Richard Lane,
Alan P. Zabarasky

Wireless used to mean slow. Motorola has changed all that with its Altair Wireless Ethernet. It overcomes those "impossible" wiring problems with aplomb—and at 10 megabits per second. By designing a system that supplements, not replaces Ethernet cabling, Motorola has focused the Altair Wireless Ethernet on the most difficult part of any wiring scheme: the ultimate connection to the user's desk. In use, it is indistinguishable from an Ethernet cable. In cost, it is competitive with in-the-wall wiring in most metropolitan areas. Motorola has given networked offices the freedom to install PCs without concern for the wiring, with realistic prices and superb performance.

Motorola Inc. ■ 3209 N. Wilke Rd.
Arlington Heights, IL 60004 ■ 800-233-0877

F I N A L I S T S

BeyondMail, Version 1.0

Frank Germano, Eugene Lee

What do you get when you cross artificial intelligence and e-mail? *BeyondMail*, which offers new hope to mail-inundated users everywhere. *BeyondMail* uses a built-in application language to screen,



organize, and prioritize your mail, and it can even toss out junk mail according to your instructions. We are especially impressed by its ability to route messages to others based on content. And *BeyondMail* runs on your PC, not on a central mail server. The label *artificial intelligence* is the kiss of death for most products; Beyond has turned the concept into an enormous advance for e-mail.

Beyond Inc. ■ 38 Sydney St.
Cambridge, MA 02139 ■ 617-621-0095

The Clarkson Packet Driver Collection

Russell Nelson

When it's time to bridge your LAN-based system to other computers or other networks, you need a packet driver—clever software that allows multiple protocol stacks to be in operation at the same time. Following FTP Software's specifications, the pioneering work on packet drivers was done at Clarkson University by Russell Nelson. His handiwork, distributed all over the world via BBSs and Internet, has become the basis for an entire facet of the connectivity industry. This finalist is a standard rather than a product. We applaud Dr. Nelson's groundbreaking efforts.

Crynwr Software ■ 11 Grant St.
Potsdam, NY 13676 ■ 315-268-1925

Of the 106 printers *PC Magazine* tested, only one was able to produce this document.



It'll be at least twelve months before another printer can show you this kind of output.

Because only the new IBM LaserPrinter 10 met the demanding criteria for "advancing the industry's lot" and "redefining the state of the art" it took to earn this year's *PC Magazine* Award for Technical Excellence for printers.

PC Magazine also singled out the LaserPrinter 10 for an Editors' Choice award, citing "the fastest PostScript® graphics we've ever seen from a desktop laser printer," praising its optional "true 600-dpi output—

IBM
LaserPrinters

no marketing doublespeak or technical gimmickry," and describing it as "bristling with paper-handling options."

High praise indeed, especially for a company that's less than a year old: Lexmark International, created from a division of IBM to develop, manufacture and distribute IBM personal printers, typewriters, keyboards and supplies.

For your nearest dealer, call 1 800 IBM-2468, ext. 804, and see the award-winning IBM LaserPrinter 10. One printer that's at least a year ahead of the pack.

LEXMARK™

Developer, manufacturer and distributor of IBM LaserPrinters.

PC Magazine Technical Excellence Logo ©1991, Ziff Communications Company. PC Magazine and the PC Magazine Technical Excellence Logo are trademarks of Ziff Davis Publishing Company. IBM is a registered trademark of IBM Corp. in the United States and/or other countries and is used under license. PostScript is a registered trademark of Adobe Systems Incorporated. Output produced with the new IBM LaserPrinter 10 at 600 x 600 dpi. ©1991 Lexmark International, Inc.

THE NEW IBM LASERPRINTERS. PAGES AHEAD.

CIRCLE 514 ON READER SERVICE CARD

If you've wished your WordPerfect®



Maybe your old word processor is a bit out of date. Perhaps the files aren't compatible with other word processors in your office. And it probably just doesn't have the power or the features of WordPerfect.

But it may still serve a purpose: because now, for a limited time, you may be able to turn your old word processor into a WordPerfect word processor. Just trade it in and get substantial savings on the WordPerfect version of

your choice. And if you haven't made the choice between DOS, Windows and OS/2, that's fine. Because when you trade up to WordPerfect, you can be licensed to use all three on one machine.

To take advantage of this special trade-up offer, you don't even have to give us your old software. Just show your WordPerfect dealer a proof-of-purchase such as your manual or a diskette from your old word processor, and you're all set.



word processor were you're in luck.



Each trade-up offer is a little different, depending on the WordPerfect version you want.

Users of certain DOS, Windows, and Macintosh word processors can trade theirs in to get the corresponding WordPerfect product for just \$150 (\$179 in Canada). You can even get LetterPerfect for just \$89 (\$110 in Canada) when you trade in one of the appropriate word processors. And we also have a trade-up offer for those of you on UNIX, VAX or Data General machines.

If you want to know if your specific word processor

qualifies you for this limited offer, just call us at (800) 526-5012. We'll tell you if a trade-up offer is available for your software and give you more information about the version of WordPerfect you're interested in.

This offer ends on March 31, 1992. So don't wait to turn your old word processor into WordPerfect. The perfect time is now.

WordPerfect
CORPORATION

NOW'S THE PERFECT TIME



NetWare, Version 3.11

Kevin Auger, Howard Davis, Drew Major,
Doug Snapp

The latest release of *NetWare* is a huge leap forward for network operating systems. It is a robust system that connects virtually everything worth connecting with the security and management services so critical to running a big, complex network. PCs, Macs, workstations, and minicomputers can all share the same files and communication services. Novell's standard-setting efforts have created a huge aftermarket of NLMs and add-on products. Novell is to be commended for its greater support of TCP/IP, and especially for the ability to run *NetWare* subnetworks across an IP backbone. Beyond its growing ecumenism, Novell remains an important performance leader. In view of the impressive multiplatform support, there is almost no connectivity problem you cannot solve with *NetWare*.

Novell Inc. ■ 122 East 1700 South ■ P.O. Box 5900
Provo, UT 84606-6194 ■ 801-429-7000

Shiva NetModem/E

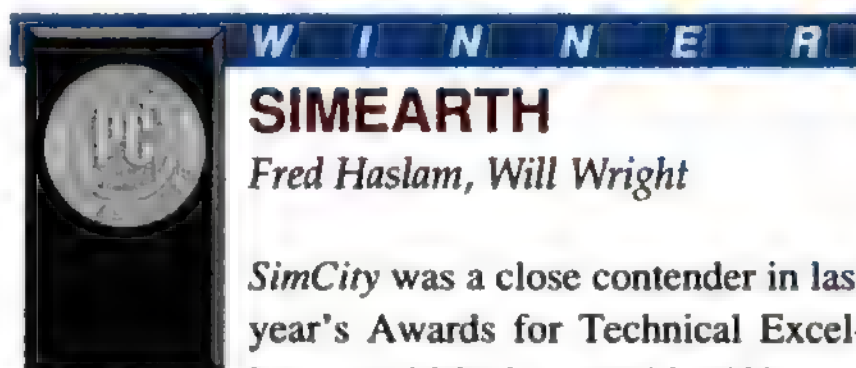
Mark Aisenberg, Marty DelVecchio, Dave McCool, Tom McCormack, Seth Miller,
Frank Slaughter, Bert Vincent

Shiva Corp. offers an innovative solution to a pair of problems as old as networking: dialing in and dialing out. Asynchronous gateways and shared modems have in some cases been more trouble than they're worth. Shiva ends all that with a single unit that allows users to dial into or out from an Ethernet network over a single phone line. The Shiva NetModem/E sports a network interface, a 9,600-bps modem, and configurable *NetWare* IPX firmware. Better, it supports protocols and compression all the way up to V.42bis and has comprehensive security provisions, including dialback. With the explosion of portable computers that need to dial in and get onto the LAN, the NetModem/E could hardly have come at a better time.

Shiva Corp. ■ One Cambridge Center
Cambridge, MA 02142 ■ 617-252-6300

After Hours

Sometime around the beginning of this decade, word got out: The PC, loaded with a hard disk, a 32-bit CPU, and VGA, made a pretty good game machine. The most entertaining products of 1991 made it clear that no computer user need be a dull boy or girl—or grown-up.



SIMEARTH

Fred Haslam, Will Wright

SimCity was a close contender in last year's Awards for Technical Excellence, and Maxis topped itself by expanding the player's purview to the entire planet. This is simulation at its best: strategy, unpredictability, immutable physical laws, rich detail, the occasional destruction of the planet. *SimEarth* pulls together graphics, music, sound effects, and an effective user interface to provide countless hours of entertaining (and harrowing) simulation. This is no mere game. This is the biology and geology of an entire planet. It is educational and challenging. And if you get tired of Earth, it lets you terraform Mars or Venus. What's next? *SimUniverse*?

Maxis ■ Distributed by Broderbund Software Inc.
17 Paul Dr. ■ San Rafael, CA 94903-2101
415-492-3200

F I N A L I S T S

Dycam Model 1 Digital Camera

Jon Barrett, Steve Heinold, George Ismael,
Jas Jain, Scott Loftin

The Dycam Model 1 is the perfect companion and, in some cases, the successor to the hand scanner. It is just the ticket for in-house newsletters, insurance claims, and manuals—any application, in fact, where you



want to get a black-and-white photo into a PC. It's a point-and-shoot camera that talks directly to the PC through the serial port. It takes up to 32 images with 256 shades of gray and dumps them out in TIFF format. Never before has so much photographic, video, and digital technology come together in one hand-held, attractive package. The Dycam Model I is a tour de force of user-friendly engineering.

Dycam Inc. ■ 9588 Topanga Canyon Blvd.
Chatsworth, CA 91311 ■ 818-998-8008

Links: The Challenge of Golf

The Links Design Team

Faster processors and improved graphics mean more-realistic simulations, and one of the best is *Links: The Challenge of Golf*. *Links* is as close to being on the course as you can get while sitting at a keyboard. The lifelike look of the fairways, trees, sand traps, and greens are the result of digitized 256-color images of a real golf course, San Diego's Torrey Pines. Every sound is faithfully reproduced in Access's RealSound system, which does wonders for your PC's speaker or works well with the major sound boards, such as the AdLib or SoundBlaster. You will hear the welcome smack of a well-hit drive or the chilling splash of an

unforgiving slice. Offering greater detail and more options than the other golf simulations, *Links* lets you control the exact placement of your feet.

Access Software Inc. ■ 4910 Amelia Earhart Dr.
Salt Lake City, UT 84116 ■ 801-359-2900

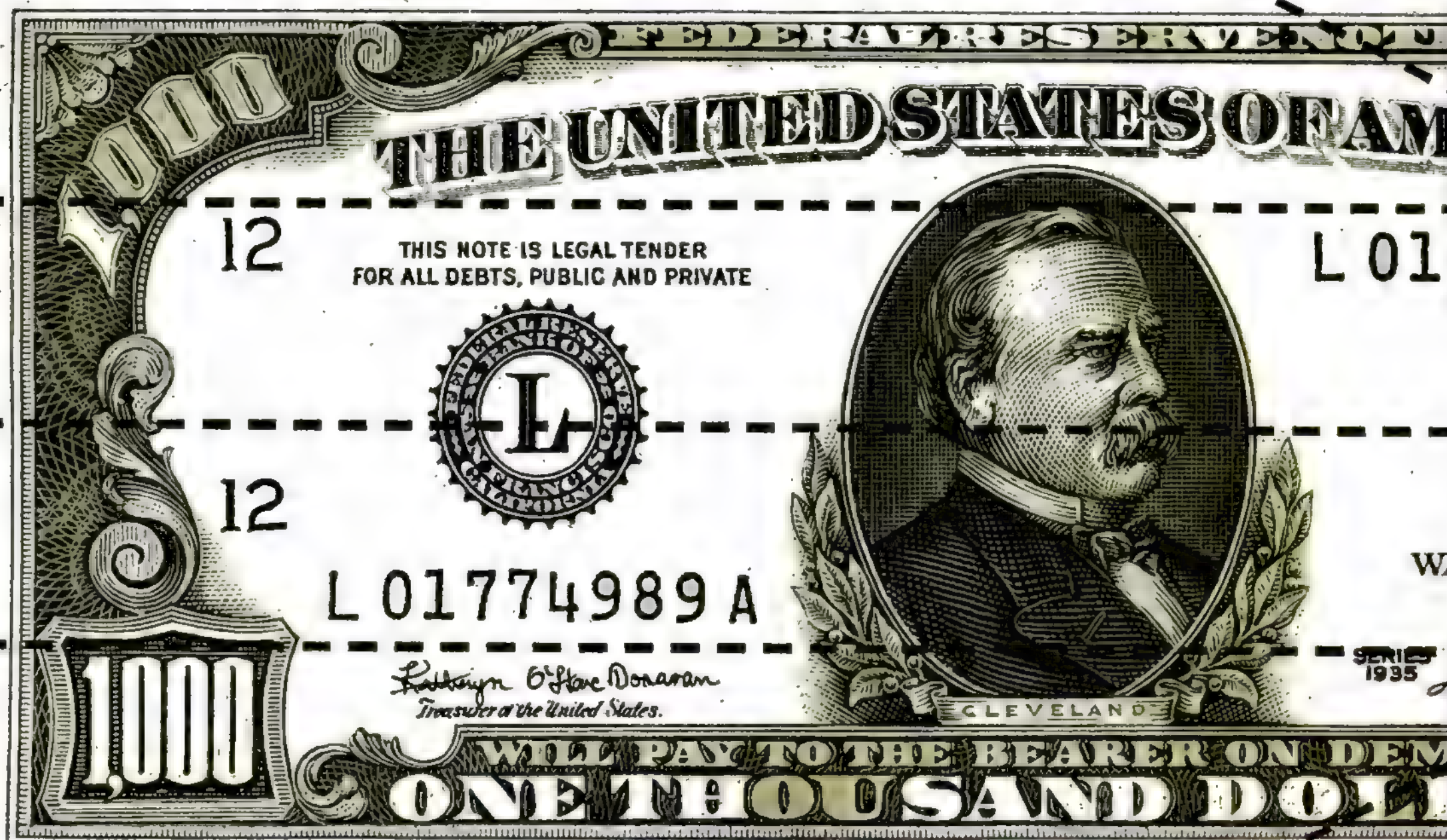
Mammals: A Multimedia Encyclopedia

Developed jointly by National Geographic Society Educational Media Division and IBM

It's an encyclopedia. It's a game. It's multimedia. It's *Mammals*, a CD-ROM reference guide to more than 200 of our warm-blooded relatives. National Geographic and IBM have pioneered in putting animation onto a CD-ROM, along with sound clips and still pictures. In addition to the usual academic information, *Mammals* has a sprightly game that takes you through the animal orders, identifying species and, most of all, learning. National Geographic didn't wait for the multimedia standards but forged ahead with a significant and well-executed product.

National Geographic Society Educational Media
Division ■ 1145 17th St. NW ■ Washington, DC
20036 ■ 202-857-7300

**THROW IT OUT THE WINDOW
AND YOU'LL KNOW WHAT
IT'S LIKE TO BUY THAT OTHER
HIGH-END COMPUTER.**



A. Fold bill in half lengthwise.



B. Fold back front corners.



C. Make second fold on front corners.



D. Make a second lengthwise fold down.



E. Hold airplane up between thumb and forefinger.



F. Open a window. Toss.



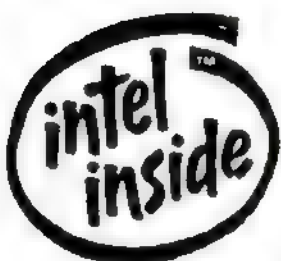
Introducing the Dell® 486D/25. A high flying computer for a down to earth price.

And it's designed to allow easy upgrades to hard disks, memory, even a faster 33 MHz CPU. Which is like getting a new computer without getting a new computer.

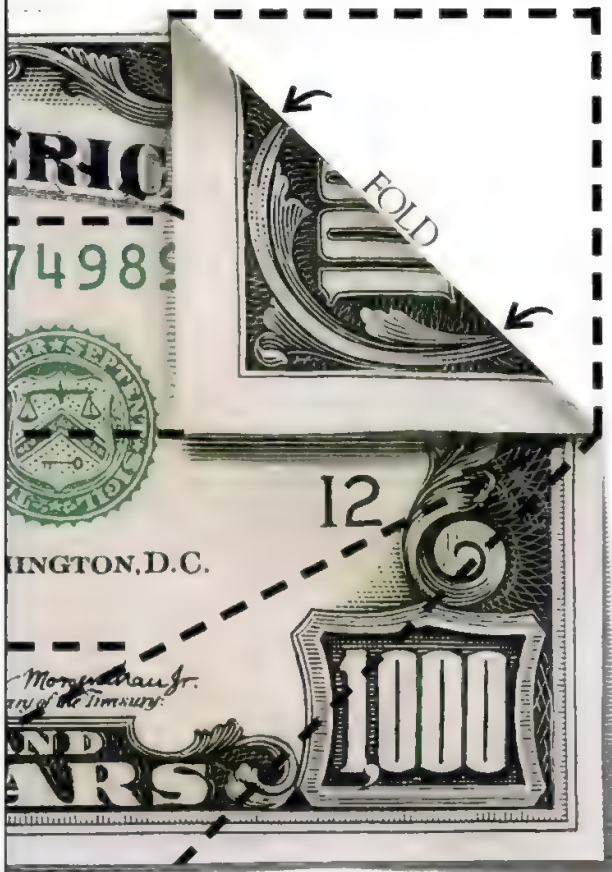
Best of all, the 486D/25 is from Dell. The company that's built a \$546 million international business by always going above and beyond the call. By designing and building our computers ourselves. By putting

them through tests the Marines would be proud of. By backing each one with a service and support package described as "overkill" by the editors of PC Week. And by doing it all without the mark-ups and hassles of traditional retailer channels.

So what are you waiting for? Call and buy a Dell 486D/25 today. You'll be spending your money economically not aeronautically.



All prices and specifications are subject to change without notice. **Payment based on 36-month, open-end lease. Leasing arranged by Leasing Group, Inc. In Canada and Mexico, Phase I Office Based Small to Medium Sized Businesses™ Responses from Business End Users at 1,784 business sites. Small to Medium Sized Businesses were based on office sites with between Inside Logo are trademarks of Intel Corporation. MS-DOS is a registered trademark of Microsoft Corporation. Dell disclaims proprietary interest in the marks and names of others. Service



Lease^o: \$130/MO.**

TECH STUFF

i486™SX 25 MHz processor ➤ Upgradeable processor ➤ 4 MB RAM (expandable to 64 MB) ➤ 100 MB - 17ms IDE Hard Drive ➤ 1024 x 768 non-interlaced, .28mm dot pitch ➤ 5.25" 1.2 MB or 3.5" 1.44 MB Floppy Drive ➤ 512 KB video RAM, expandable to 1 MB

SERVICE AND SUPPORT

On-site desk-side service contract included in the system price the first year*
 — Toll-free technical support hotline — Toll-free TechFax™ line for 24-hour system information — On-line Bulletin Board communication with technical staff and other users — Self-diagnostic software — Free factory installation of selected MS-DOS® software applications — Information Service Support Forum on CompuServe

COMPANY AWARDS

Dell has won PC Week Corporate Satisfaction Polls an unprecedented 8 times
 ★ Dell ranked Best Personal Computer in Small to Medium Sized Businesses in the J.D. Power and Associates® Customer Satisfaction Index ★ Dell has won PC World's 1991 World Class Award for Best Service and Support/Hardware.



THE NUMBER

8 0 0 - 5 4 5 - 1 5 8 3

Please reference 11BP6 when calling

Mon-Fri. between 7am-9pm CT, Sat 8am-4pm CT, Sun 10am-3pm CT ☎

In Canada, (800)668-3021 ☎ In Mexico, 95-800-010-0664 ☎ Custom-

built and shipped with a 30-day no questions asked money-back guarantee



**WE DROPPED THE PRICE
OF OUR COMPUTER,
SO YOU WON'T HAVE TO
BUY A CHEAP ONE.**

\$159



All prices and specifications are subject to change without notice. **Payment based on 36-month, open-end lease. †Leasing arranged by Leasing Group, Inc. In Canada and Mexico, configurations and prices may vary. Dell is a registered trademark and TechFax is a service mark of Dell Computer Corporation. 1991 J.D. Power and Associates® Computer End User Satisfaction Study, Phase I: Office Based Small to Medium Sized Businesses. Responses from Business End Users at 1,784 business sites. Small to Medium Sized Businesses were based on office sites with between

1 and 499 employees. Best Personal Computer in Office Based End User Satisfaction in Small to Medium Sized Businesses. J.D. Power and Associates is a service mark of J.D. Power and Associates. MS-DOS and Microsoft are registered trademarks and Windows is a trademark of Microsoft Corporation. 386 and the Intel Inside Logo are trademarks of Intel Corporation. Dell disclaims any proprietary interest in the marks and names of others.

†Service provided by third party service. On-site service may not be available in certain remote locations. Shipping, handling and applicable sales tax not included in the price. © 1991 Dell Computer Corporation. All rights reserved.



Lease⁰: \$60/MO.**

i386™SX 16 MHz processor • 2 MB RAM (expandable to 6 MB) • 40 MB - 28ms
IDE Hard Drive • 640 x 480 .39mm VGA Color Monitor • 5.25" 1.2 MB or 3.5"
1.44 MB Floppy Drive • Supports resolutions up to 1024 x 768 • Novell certified

SERVICE AND SUPPORT

On-site desk-side service contract included in the system price the first year* — Toll-free
technical support hotline — Toll-free TechFax™ line for 24-hour system information
— On-line Bulletin Board communication with technical staff and other users —
Self-diagnostic software — Free factory installation of selected MS-DOS® software
applications — Backed by Dell which has become a \$546 million international
business in only 7 years — Information Service Support Forum on CompuServe

COMPANY AWARDS

Dell has won *PC Week* Corporate Satisfaction Polls an unprecedented 8 times
★ Dell ranked Best Personal Computer in Small to Medium Sized Businesses in the J.D.
Power and Associates® Customer Satisfaction Index ★ Dell has won *PC World's*
1991 World Class Award for Best Service and Support/Hardware



THE NUMBER

8 0 0 - 5 4 5 - 1 5 8 6

Please reference 11BP5 when calling

Mon-Fri. between 7am-9pm CT, Sat 8am-4pm CT, Sun 10am-3pm CT • In Canada,
(800)668-3021 • In Mexico, 95-800-010-0664 • Custom-built and shipped with a
30-day no questions asked money-back guarantee

Now you don't have to settle for less just because you have less to spend.

Dell just lowered the price of the 316SX to \$1,599. Which gets you everything you need to run Windows™ for a price that won't make you jump out of one.

And even at this smaller price, you still get the big advantage of dealing directly with Dell. The company that's become one of the most awarded PC companies in the world by designing, building and rigorously testing our computers ourselves. By backing each one with a service and support package described as "overkill" by the editors of *PC Week*. And by doing it without the mark-ups and hassles of traditional retail channels. So though the Dell® 316SX is quite inexpensive, it's anything but cheap. And now we've dropped the price.

So what are you waiting for? Pick up the phone.



CIRCLE 470 ON READER SERVICE CARD



PHOTOGRAPH: MAGNUM PHOTOS

Person of the PC Decade

Philip D. (Don) Estridge

Even though five years have passed since his death, the forces that Don Estridge put into play a decade ago continue to shape the industry. As the president of IBM's Entry Systems Division and one of the chief architects of the IBM PC, Estridge made it safe for Corporate America to buy personal computers. He forged the critical alliances with off-the-shelf hardware and software vendors and created an open standard—by challenging and overcoming some of the most hallowed traditions in the IBM culture.

Bill Machrone is the publishing director of PC Magazine. Michael Miller is the editor-in-chief of PC Magazine.

Some may say that the standard got away from IBM, but once the door was open, there was no turning back. The rise of the microprocessor, the shift to end-user computing, and the downsizing of applications were inevitable. But Estridge's vision, integrity, and purpose made these things happen in a way that benefited all of us.

In recognition of Estridge's contribution, *PC Magazine* has made a special donation to The University of Florida Foundation for the Philip D. and Mary Ann Estridge Scholarship Endowment.

Lifetime Achievement

Daniel Bricklin and Robert Frankston

The electronic spreadsheet is so commonplace in American business that we can hardly remember that it wasn't always around. The spreadsheet as we know it dates back to 1979, with the introduction of *VisiCalc*. Dan Bricklin, who was a student at the Harvard Business School, had the idea for an electronic ledger. He and programmer Bob Frankston refined the idea into *VisiCalc* for the Apple II.

Although this initial spreadsheet worked in less than 32K memory, it had almost all of the basic concepts we now take for granted in spreadsheets, including the row and column orientation, hidden formulas behind cells, formatting commands, and help.

Spreadsheets were immediately recognized as the first compelling application for the burgeoning personal computer industry. *VisiCalc* took the PC out of the hobbyist market and introduced it to thousands of businesspeople. Today, spreadsheets, along with word processors, form the core applications for most personal computer users.

Bricklin and Frankston have since created and contributed to several other well-known computer programs, and both are now working for Slate Corp., a developer of pen-based applications in Scottsdale, Arizona. Their creation of the electronic spreadsheet changed not only the way we use computers but the way we run our companies.



PHOTOGRAPH DAMA SIGALL



Person of the Year

Philippe Kahn, CEO

Borland International Inc.

What is there to say about Philippe Kahn that you don't already know? A one-time math teacher, Kahn came to Silicon Valley in 1982 with almost no money, a tremendous gift of gab, and a nose for great products. His Borland International took Turbo Pascal and made it the industry standard. In less than a decade, Borland has gained ground on far larger competitors and introduced many innovative programs, including *Sidekick*, *ObjectVision*, and Turbo Pascal for *Windows*. Borland's Turbo C++ has become an industry standard, and *Quattro Pro* has become the biggest challenger to Lotus's venerable spreadsheet, *1-2-3*. In 1991, having turned *Paradox* into a major challenger to Ashton-Tate's faltering industry leader, *dBASE IV*, Kahn redefined the database landscape by acquiring Ashton-Tate. Merging two companies with incompatible databases, competitive products, and radically different cultures may be Kahn's biggest challenge, but we are sure he will attack it with his customary vigor, wit, and style.



PHOTOGRAPHY BRUCE FORRESTER

It's all here in black and white. And color when you need it.

Black text memo

most memos clearly present your information in a more professional, serious-looking manner. It comes to you in a graphic, color presentation that have to make information in the color is the way.

In fact, studies shown that color increase the information in the chart as well as readers retention information.

A study by the Communications Company, conducted three experiments was conducted in a natural setting, a controlled laboratory environment. Attitudinal, cognitive and physiological measures were used to assess the impact of three factors: color, shape and size. In the first experiment, the effectiveness of one-color, two-color, and

three masters were identical with the

color presentation

Color Makes the Message

The effect of color on business communications.

Category	Readership (hundreds)
black text memo	1.5
memo w/ black chart	3.5
memo w/ color chart	5.5
color presentation	8.5

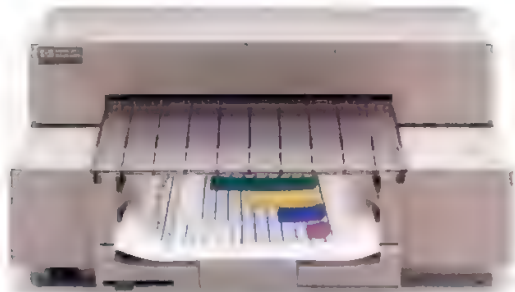
measurement of readership in hundreds

The best features of HP's DeskJet 500

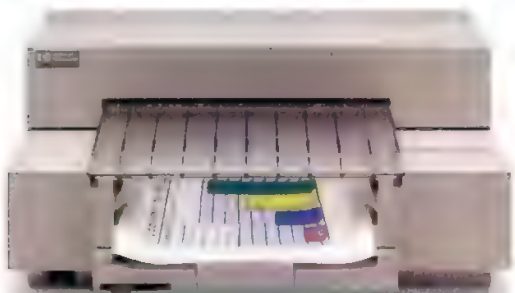
Take all that, add a nearly endless choice of attention-getting colors, and your users have one very valuable

With the DeskJet 500C and DeskWriter C, Hewlett-Packard introduces a colorful new generation to its family of inkjet printers. A family that stands for affordable quality. Quality that's backed by a three-year warranty.

Affordable color.
The HP DeskWriter C printer
for the Mac.



And the
HP DeskJet 500C for PCs.



Only \$1,095 each.

So when others ask you what's new, tell them to get ready for a splash of color. For more interesting graphs and charts. For impressive cover pages and for compelling overhead presentations. All for \$1,095.

If you'd like to see some sample output from the DeskJet 500C or DeskWriter C, call 1-800-752-0900, Ext. 2757.† Or visit your nearest authorized HP dealer and sign up

for a chance to win a Caribbean cruise for two.** Color has finally arrived.

HP Peripherals
When it's important to you.



**HEWLETT
PACKARD**

Discover PREMIER

PREMIER is PC Magazine's innovative resource for PC buyers. Turn to **PREMIER** for an array of dynamic companies and their exciting PC products and services. Examine state-of-the-art hardware, software and accessories, poised to become household words in the PC industry. All spotlighted at your fingertips in an easy-to-find, full color showcase. Discover it for yourself: start on page 436 and explore the world of **PREMIER**. Advertisers: To target over 800,000 PC buyers in this high-impact, cost-effective section, call 1-800-825-4237.



It's here...
PREMIER

TECHNICAL EXCELLENCE COVER STORY



AWARDS FOR TECHNICAL EXCELLENCE: PREVIOUS WINNERS

Year	Winner	Company	Category
1990			
	Compaq Systempro	Compaq Computer Corp.	PCs
	Compton's MultiMedia Encyclopedia	Britannica Software Inc.	Entertainment/After Hours
	Finis Conner	Conner Peripherals	Persons of the Year
	Developer's RenderMan	Pixar	Software
	Edsun Continuous Edge Graphics	Edsun Laboratories Inc.	Emerging Technology
	Adele Goldberg	Xerox's Palo Alto Research Center	Lifetime Achievement
	HP LaserJet III	Hewlett-Packard Co.	Hardware
	HP NewWave, Version 3.0	Hewlett-Packard Co.	Operating Environments
	Terry Johnson	PrairieTek	Persons of the Year
	LANtastic Voice Adapter	Artisoft Inc.	Connectivity
	Sharp PC-6220	Sharp Electronics Corp.	Portables
	Texas Instruments TravelMate 2000	Texas Instruments	Portables
	Turbo C++ Professional	Borland International Inc.	Development Tools
	Xircom Pocket LAN Adapter	Xircom Inc.	Design
1989			
	Audio Visual Connection	IBM Corp.	Hardware
	Autodesk Animator	Autodesk Inc.	Graphics
	Joseph R. Canion	Compaq Corp.	Person of the Year
	IBM LaserPrinter	IBM Corp.	Printers
	Lotus Magellan	Lotus Development Corp.	Utilities
	MultiScope OS/2 Debugger	Logitech Inc.	Development Tools
	NetWare 386, Version 3.0	Novell Inc.	Connectivity
	OS/2, Version 1.2	IBM Corp., Microsoft Corp.	Operating Environments
	The Poqet PC	Poqet Computer Corp.	Portables
	Quattro Pro	Borland International Inc.	Applications
	Roland LAPC-I	Roland Corp. US	Entertainment/After Hours
	John Warnock	Adobe Systems Inc.	Lifetime Achievement
1988			
	All Chargecard	All Computers	Add-in Boards
	ALR FlexCache 25386	Advanced Logic Research Inc.	Desktop Machines
	Intel 80386 Design Team	Intel Corp.	Persons of the Year
	Kurta IS/ONE Cordless Stylus/Puck	Kurta Corp.	Hardware
	Lahey Fortran 286 and 386	Lahey Computer Systems Inc.	Compilers/Languages
	Micrografx Designer	Micrografx Inc.	Graphics Software
	Microsoft Mouse	Microsoft Corp.	Design
	NEC UltraLite	NEC Home Electronics (U.S.A.) Inc.	Portables
	Q&A, Version 3.0	Symantec Corp.	Application Software
	Dennis Ritchie	AT&T Bell Laboratories	Lifetime Achievement
	SunRiver Workstation	SunRiver Corp.	Connectivity
	Turbo Debugger	Borland International Inc.	Development Tools
	VM/386	Intelligent Graphics Corp.	386 Software Technology
1987			
	AutoShade	Autodesk Inc.	Graphics Software
	Compaq Deskpro 386/20	Compaq Computer Corp.	Desktop Computers
	Compaq Portable 386	Compaq Computer Corp.	Portable Computers
	Douglas Engelbart	McDonnell Douglas Information Systems Group	Lifetime Achievement

CONTINUES

Introducing point and click video production from Truevision.



Truevision TARGA+ and VideoMaker+ multiply the power of your PC.

Desktop video production just got easier. VideoMaker+ with a Truevision TARGA+ Graphics Engine lets you perform stunning special effects and manipulate video by simply pointing and clicking on the switcher interface.

No more DOS commands. No more blind guesswork. All kinds of creative possibilities.

Create professional transitions between graphics and live or recorded video. Chromakey video over graphics, or overlay anti-aliased text onto video. Create your production in real time, and do it all quickly and easily through the intuitive VideoMaker+ switcher.

Right out of the box, you're in control. And right away, your PC capabilities are multiplied. Point yourself to a Truevision dealer for more information.



TRUEVISION®

CIRCLE 342 ON READER SERVICE CARD

7340 Shadeland Station, Indianapolis, IN 46256

INTERNATIONAL: Canada 416/940-8727 France 33-1-3-952-8253 Italy 39-2-242-4551

U.K. 44-628-77-7800 West Germany 49-89-612-0010 Other international 617/229-6900

VideoMaker+
combines with
the Truevision
TARGA+ series
for a complete
video production
solution.

Call
800-858-TRUE
For more information

© 1991, Truevision, Inc.

THE MOST POWER



FUL 486SX. GOING.

Behold the new Toshiba T4400SX notebook—the first 486SX computer to offer all the power and performance of a desktop computer while freeing you from the tyranny of the nearest electrical outlet.

For starters, the T4400SX offers a 25 MHz 486SX microprocessor with 8K internal cache, upgradable to a full 486DX. Plus an 80 MB hard drive and standard 2 MB RAM, expandable to 10 MB.



You can use our credit card-sized memory modules to expand standard 2MB RAM to 10MB for added speed and multi-tasking capabilities.

The T4400SX is the only notebook computer that offers a high-speed Gas Plasma screen, which means no mouse blur. And its 100:1 contrast ratio delivers seven times the contrast of a typical LCD display.

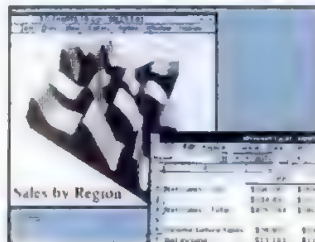
Or if you prefer, you can choose our 9.5" diagonal LCD display, the most state-of-the-art LCD available, with uncompromising clarity from the black and white ultra thin screen.

Both offer a 640 x 480 VGA high-resolution display as well as the graphic versatility of 16 gray scales for the gas plasma screen and 64 gray scales for the LCD screen.

For familiarity and ease of use, the T4400SX has a full-function keyboard with standard size keys and key spacing.

The Nickel Cadmium battery provides more than three hours of computing power. Our AutoResume feature allows you to shut down and start up precisely where you left off.

And for added expandability and connectivity, there are built-in parallel, serial, video, keypad/board, mouse and bus expansion ports. There's even



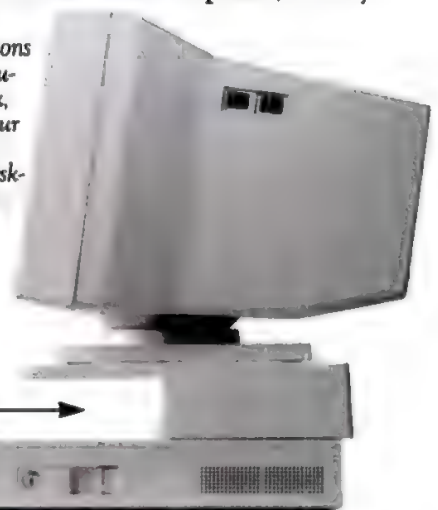
If you choose the 9.5" diagonal LCD display, you get the versatility of 64 gray scales as well as high-resolution 640 x 480 VGA on the black and white ultra thin screen.

a dedicated modem slot for an optional internal cellular-ready, 9600 bps fax or standard modem.

All that in an ultra-strong 11.7" W x 8.3" D x 2.2" H carbon fiber-reinforced case weighing only 7.25 lbs that fits into half a briefcase.

If you'd like to know more about the T4400SX notebook computer, or any

On those occasions when you're actually at your desk, you can plug your T4400SX into our optional Desk-Station IV with all standard desktop hardware connections and expandability.



of our full line of Toshiba portables, call us at 1-800-457-7777.

We'll send you information that can lead to only one conclusion about desktop computers:

Going. Going. Gone.

In Touch with Tomorrow
TOSHIBA

CIRCLE 379 ON READER SERVICE CARD

S U P E R R D T E C H N O L O G Y

4 ways to tell the real thing from fool's gold.

In 1983 we introduced the world to the Gold Standard of Technology. Others have followed but never equalled our single-minded pursuit of superior floppy disk performance. And now, 8 years later, we're pleased to present the Maxell Super RD MF2-HD. Don't be fooled by anything less.

1. Look for a better shutter system.



Our new Dual Interlocking Flex Shutter (pat. pending) not only ensures ultra-smooth openings and closings, but a virtually airtight internal floppy disk environment. And our unique Dual Interlocking mechanism greatly reduces the chance that the shutter will be opened or damaged should you drop the disk.



2. Look for a better shell material.

Our composite shell employs a highly flexible material that allows constant contact between the

floppy's magnetic disk and your computer's drive head. So no matter what the individual characteristics of your drive unit, you get maximum data read/write accuracy.

3. Look for enhanced magnetic particle performance.



The Maxell HE Magnetic Particles used in the SUPER RD MF2-HD offer superior signal output stability and a significant improvement in the signal to noise ratio. Which ensures every disk will generate a full power signal and enhanced compatibility between machines.

4. Look for the name Maxell.



One name says it all. Reliability. Innovation. Leadership. The Gold Standard. Only from Maxell.



maxell
THE GOLD STANDARD



AWARDS FOR TECHNICAL EXCELLENCE: PREVIOUS WINNERS

Year	Winner	Company	Category
1987 (continued)			
	LIM expanded memory specification 4.0	Lotus Development Corp., Intel Corp., Microsoft Corp.	Utilities
	Lucid 3D	Personal Computer Support Group	Application Software
	Micro Channel architecture	IBM Corp.	Special Category
	Microsoft Excel for Windows	Microsoft Corp.	Application Software
	Microsoft Windows 386	Microsoft Corp.	Operating Environments
	Publisher's Type Foundry	ZSoft Corp.	Desktop Publishing
	QuickBASIC, Version 4.0	Microsoft Corp.	Development Tools
	3Com 10Mb Twisted Pair	3Com Corp.	Connectivity
	Turbo Pascal, Version 4.0	Borland International Inc.	Development Tools
	Zenith Perfect Monitor, Model ZCM-1490	Zenith Data Systems	Hardware
1986			
	Advanced NetWare/286	Novell Inc.	Networking
	Compaq Deskpro 386	Compaq Computer Corp.	Desktop Computers
	Bill Gates	Microsoft Corp.	Special Award
	Lotus HAL	Lotus Development Corp.	Software Add-ons
	Microsoft Windows, Version 1.03	Microsoft Corp.	Environments
	NEC MultiSync	NEC Home Electronics USA Inc.	Graphics Hardware
	NewViews	Q.W. Page Associates Inc.	Application Software
	Perspective	Three D Graphics	Graphics Software
	QuickBASIC 2	Microsoft Corp.	Programming Languages
	TIPS	Island Graphics Corp.	Graphics Software
	Toshiba T3100	Toshiba America Information Systems Inc.	Portable Computers
	What's Best!	General Optimization Inc.	Software Add-ons
	Zenith Z-181 Portable PC	Zenith Data Systems	Portable Computers
1985			
	Apple LaserWriter	Apple Computer Inc.	N/A
	Mike Brown	Central Point Software	Special Award
	EGA CHIPSset	Chips and Technologies Inc.	N/A
	Freelance	Lotus Development Corp.	N/A
	IBM Proprinter	IBM Corp.	N/A
	Javelin	Javelin Software Corp.	N/A
	LANLink	The Software Link	N/A
	Plus Hardcard	Plus Development Corp.	N/A
	Trailblazer modem	Telebit Corp.	N/A
1984			
	Enable	The Software Group	N/A
	Framework	Ashton-Tate Corp.	N/A
	Infoscape	Microstuf	N/A
	Intel 80286	Intel Corp.	N/A
	PC Blue Series	(Public domain)	N/A
	Turbo Pascal	Borland International Inc.	N/A

N/A—Not applicable. Winners were not designated by category in 1984 and 1985.

ENDS

Computers, FCC Class A, Class B, and You — or When is it better to get a B than an A?

You need to know the difference between computers that meet the FCC class B radio frequency emissions standards and those that meet only the Class A standards.

Computers emit radio signals in their operation. Because these signals may cause interference to radio and television reception, the marketing and the use of computers is regulated by the Federal Communications Commission. Under federal rules, computer users are responsible for remedying interference, including interference in neighboring homes.

Computers certified by the FCC as meeting the Class B standard are less likely to cause interference to radio and TV reception than those that have been verified by the manufacturer or importer to the Class A standards. Only Class B certified computers may be advertised, sold, or leased for use in residences. A similar regulatory program applies in Canada.

Buyers seeking computers for use in homes (including offices at home) should shop for computers and peripherals which have been Class B certified. These devices carry a label with an FCC ID number. Both new and used Class A verified devices may be sold only for use in commercial and industrial locations. Signals from computers are more likely to be masked by electrical noise from other equipment in such an environment. These areas are also likely to have fewer radios and TVs. Accordingly, equipment marketed only for use in these locations may meet the less rigorous Class A standard. Class B certified equipment may be marketed for use in residences as well as commercial and industrial locations.

As you shop for a computer for use in your home, look for the FCC classification in the specifications or ask your vendor to recommend only machines that have been certified to the Class B limits. TV viewers and radio listeners in your home and in neighboring homes will be glad you did.



This is what you get
out of a \$4999,
plain paper, 300 dpi,
PostScript language
compatible printer.



Then again, so's this.

The choice is yours. You can stick with plain old black and white laser printing. Or you can pick the new Seiko Instruments Personal ColorPoint printer, and get rich laser-quality color documents.

You'll get sharp 300 dpi images on laser plain paper and transparencies. Speedy RISC processing. 100% PostScript language compatibility. And the ability to connect to Macintosh, PCs, and UNIX workstations simultaneously.

All for a monochrome price.

Which means switching to color is a black and white choice. So for your nearest Personal ColorPoint dealer, call 1-800-873-4561, department SI-98.



Introducing the Personal ColorPoint printer.

SII 
Seiko Instruments

Personal ColorPoint is a trademark of Seiko Instruments USA Inc. PostScript is a registered trademark of Adobe Systems, Inc. Macintosh is a registered trademark of Apple Computer, Inc. UNIX is a registered trademark of AT&T.
© 1988 Seiko Instruments USA Inc. All rights reserved.



ORACLE SERVER FOR NETWARE WENT TO SARA LEE AND HAD THE COMPETITION FOR DESSERT.

**"ORACLE SERVER NLM TAKES
TOP HONORS FOR SPEED,
RELIABILITY AND ROBUSTNESS"**
Sara Lee Corp. and PC Week Labs.

"The project at Sara Lee was ambitious. The original database application that the company wanted to downsize to the client/server platform was a subset of its order-entry records..."

"In the end, ORACLE Server [for NetWare] was the only software that met all the stringent requirements for the application..."

"While each product competing in the shootout displayed strength in one area or another, ORACLE Server was at or near

the top in nearly every competition.

"ORACLE Server's performance shined on database queries that required complex aggregations—sometimes more than twice as fast as other products..."

"In selecting ORACLE Server as the winner, the judges considered other factors such as product maturity and experience with corporate databases, and the selection of front-end tools to access the database.

"(And) even though the NLM version of ORACLE Server was new, it was considered to be a close extension of the firm's OS/2 and Unix products, which are proven technology on client/server platforms."

—PC Week June 24, 1991

Hungry for more? ORACLE Server for NetWare just recorded the highest audited TPC Benchmark™ B rate ever on a PC—43 tpsB. At that rate, the low \$2590/tpsB is just icing on the cake.

1-800-633-0518 Ext. 4445

Call us for a complete benchmark report and reprint of the PC Week Shootout. We'll also tell you about the rest of Oracle's open family of portable software. And the support, education and consulting services that help you get the most out of your investment.

ORACLE

Software that runs on all your computers.

486SX

Great
For Intel,
But What
About You?

"Faster, cheaper, better"

has been the PC industry's battle cry. Why, then, would Intel bring out a 20-MHz 80486SX chip that costs more and runs slower than the 33-MHz 80486?



PHOTOGRAPHY: THOM O'CONNOR

by Jim Seymour

Yes, yes, but do you really want one?

Sure, the 80486SX chip is Intel Corp.'s latest, and it is one of the hottest products around. Sure, PCs built around the 486SX have garnered a lot of press. Sure, back when Intel rolled out the SX version of the 80386 chip, this product quickly became the new entry-level business-computing standard. And sure, that 386SX has become the best-selling

AcerPower 486SX
ACMA 486SX/20
ALR BusinessStation 486ASX
American Mitac 4270E
Ares 486-20SX Sonic
AST Premium II 486SX/20
Austin 486/SX20 Winstation
Blackship 486SX/20U
C² Micro 486SX
Dell PowerLine 420DE

Ergo Moby Brick 486SX-20
Everex Tempo 486SX/20
Hyundai Corporate Series 486SX/20
IBM PS/2 Model 90 XP
Leading Technology PC Partner VX
Novas 486SX-20
Standard 486SX/20 Windows
Workstation
Swan 486SX
Zeos 486SX-20C

PC microprocessor ever: By the end of 1991, Intel will have shipped almost 20 million 386SXs.

To paraphrase United States Senator Lloyd Bentsen in his debate with vice-presidential candidate Dan Quayle, the 486SX is no 386SX. Even so, the 386SX was a logical evolutionary step in the development of Intel's 80x86 microprocessor series, and it delivered real value.

The jury is still out on the value delivered by the 486SX, a slowed-down version of Intel's i486 CPU with a disabled math coprocessor. Maybe faster, cheaper versions yet to come will match the 386SX's value-for-money equation, and possibly even approach the sales records set by the 386SX.

But based on our reviews here of 19 of the first 20-MHz 486SX PCs to come to market, it remains a mystery chip: *Why* is the most interesting thing about it.

BUILDING ON THE 386SX?

The 386SX became a hit because it gave PC buyers less expensive access to the 386-series instruction set. Long before the 386SX even appeared on the scene, it was clear that the instruction set would dominate IBM-compatible personal computing well into the 1990s.

The 386SX's compromises for the sake of economy were twofold: Its clock ran slower (16 MHz at first and later 20 MHz), and while it had the 386's 32-bit internal bus, it used a 16-bit external bus. In contrast, the "real" 386 chip (soon dubbed the 386DX) was available in 16-, 20-, 25-, and 33-MHz versions, and it used 32-bit buses both internally and externally.

Even more important in the eyes of many buyers, the 386SX kept them out of the clutches of the bad ol' 286 microprocessor—a chip that was bedeviled by irreconcilable design problems and clearly was part of the history, not

the future, of personal computers.

The 486SX offers none of those advantages. All 486 chips carry forward the 386 instruction set with only minor and relatively unimportant extensions; there is no new standard being created by a "486 instruction set." The most important dif-

ferences between the 386 and the 486 are the latter's on-board floating-point unit (also known as an FPU or math coprocessor) and an 8K internal cache.

The 486SX hardly keeps us out of the clutches of a flawed predecessor; indeed, as our tests here show, 33-MHz 386-based PCs outperform these 20-MHz 486SX machines, and at lower prices. Though Intel claims the 486SX/20 outperforms the 386/33 by 5 to 10 percent in 16-bit applications, PC Magazine Labs found systems with the new processor took about 10 percent longer to complete our tests than the 386/33s we've reviewed in the past. Advanced Micro Devices' 40-MHz 386s also appear to reduce operational speeds by as much as 25 percent over the 486SXs. So these first 486SX PCs don't deliver on even the SX series' most basic promise: better performance for less

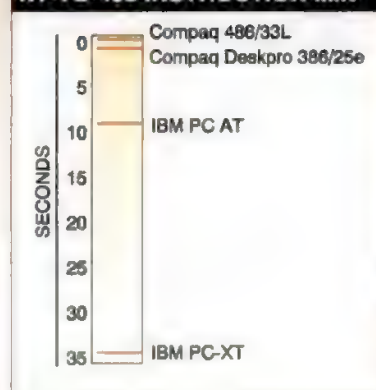


486SX: WHAT SPEED ADVANTAGE?

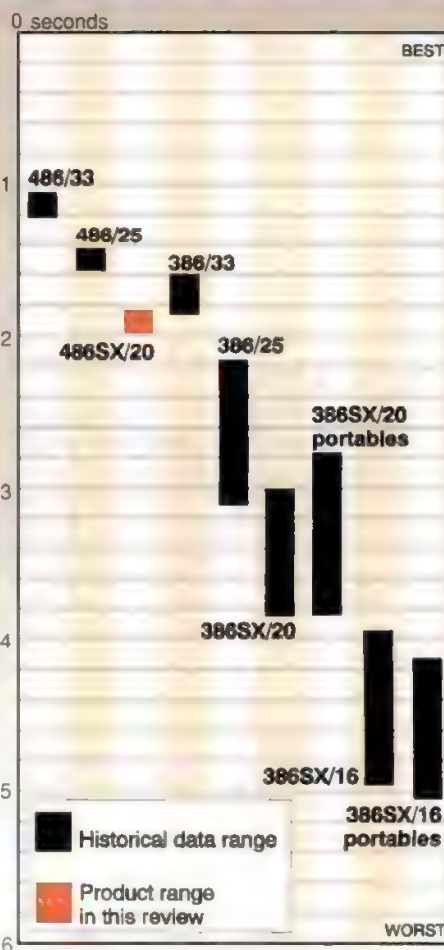
While Intel claims 486SX/20 PCs perform 5 to 10 percent faster than 33-MHz 386s, our benchmark tests showed that the systems in this review (in red) performed more slowly than the 386/33s tested by PC Magazine Labs.

The large chart, right, shows the range of Instruction Mix benchmark test scores, from fastest to slowest, for PCs tested by PC Labs over the past two years. The chart below shows the average Instruction Mix scores for the Compaq 486/33L, the Compaq Deskpro 386/25e, the 4.77-MHz IBM PC AT, and the IBM PC-XT.

XT-TO-486 INSTRUCTION MIX



INSTRUCTION MIX TEST SCORES



money than provided by the previous generation.

STRATEGIC MARKETING 101

The 486SX must perform well for someone, or why would Intel bring it to market? Two constituencies seem likely to benefit from the 486SX: Intel and its PC-manufacturer customers.

Intel hopes that by extending its 486 line downwards, it can slow the advance of AMD's speedy, 40-MHz 386 clones. Intel killed its own 286 offspring by introducing the 386SX and then running ads disparaging the 286s—once AMD and Harris began producing superior 286s. It is now to Intel's advantage to kill the 386s.

Intel can't be so heavy-handed this time: The company is still making far too much money from its 386 line. But if Intel could subtly undercut the economic viability of 386 chips by making available SX versions of its 486 design at close to 386 prices, it could replace lost 386-line

sales with 486 sales and freeze out pesky AMD, a company that Intel's lawyers hope to keep out of the 486 business.

Vendors also believe they will benefit

By extending its 486 line downward, Intel hopes to slow the advance of AMD's 40-MHz 386 clones.

from the existence of the 486SX. Especially with the rapid move to modular PCs, which feature upgradable microprocessors, PC makers believe a successful vendor must have a wide product line with many price and performance variations.

In that approach, there is indisputably a machine for every buyer, and every machine sold represents a potential second sale if that buyer later upgrades. In fact, Intel plans to cash in on that upgrade potential by introducing a series of clock-doubler chips that will allow 486SX/20, 486DX/25, and 486DX/33 CPUs to run at twice their internal clock speeds. (See the sidebar "More Megahertz: Intel Boosts CPU Speeds.") Enter the 486SX at yet another point—if a bewildering one—on that price/performance scale.

The buyer? Well, the numbers tell the story, and the reviews don't look very promising. As you will see, purchasers of 486SX-based PCs are typically buying in a kind of Death Valley. On one side are "real" 486 PCs, running at 25 or 33 MHz; some of these cost only \$200 to \$300 more than their 486SX siblings but have processors that can do the job in 25 percent less time. On the other side, 33-MHz 386s also outperform the 486SXs—yet cost \$200 or so less.



SYSTEM CONFIGURATION AND PERFORMANCE: A GUIDE TO THE GRAPHICS

BENCHMARK TESTS

The Bars

These charts show each product's scores on four tests relative to the best, worst, and average scores of the products in this article. Each colored bar represents the range of test scores for the 486SX systems, from fastest to slowest. The longer the bar, the wider the range. If the best score is more than twice as fast as average, an upward-pointing arrow appears atop the colored bar.

A black arrow on each bar represents the given system's position relative to the range of test results for this article. The higher the arrow, the better the performance. If a system performs more than twice as fast as average, the black arrow appears at the top of the bar, pointing upwards.

The Boxes

A normalized score appears in the box below each colored bar. To derive this figure, we calculated the average score for all 20-MHz 486SX systems tested and reviewed in this issue. We then divided this average by the score of each machine in turn and multiplied by 100.

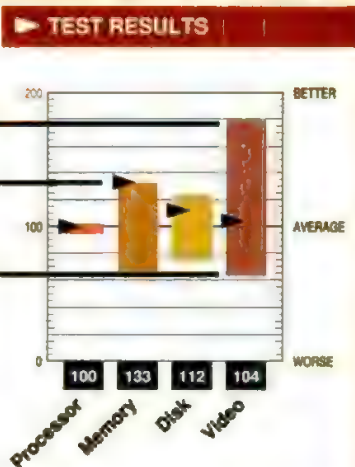
Thus the average score is 100; a number greater than 200 indicates that a system performed the test in less than half the average time; a number smaller than 50 indicates that the system took more than twice as long to complete the test.

A table of actual scores accompanies the three-dimensional bar charts.

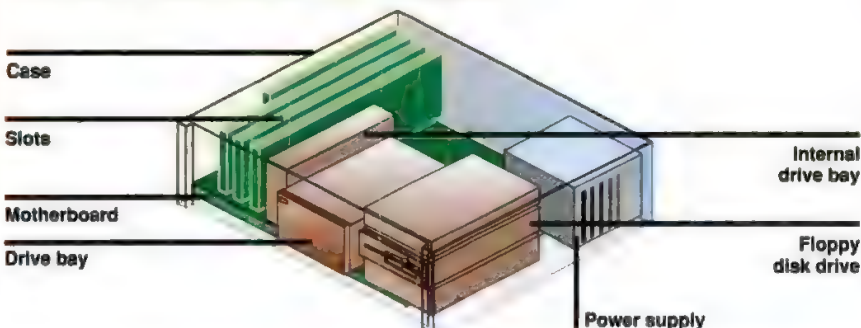
Best score
(products reviewed in this issue)

Product's score

Worst score
(products reviewed in this issue)



INTERIOR CONFIGURATION DIAGRAM



Case Options include desktop, tower, mini-tower, small-footprint, and slimline.

Slots The number and length of cards represent the number and length of slots on the motherboard.

Drive bay A hard disk face plate indicates external access to a bay. Options include full-height, half-height, third-height, and 3.5-inch.

Floppy disk drive A face plate indicates that either a 1.2MB or 1.44MB floppy disk drive was installed in our tested system.

IS THIS WHAT THEY MEAN BY "REVERSE ENGINEERING?"

A final twist in the 486SX story is destined to become part of the legend and lore of the PC business. With the 486SX, Intel had to find the critical difference that justified charging less than for 486DX chips, a difference that also sapped the 486SX's performance enough to prevent the junior chip from parasitically eroding the higher-margin 486DX sales. This time, there was no way to produce a hybrid with two different bus widths, so Intel decided to chop out the 486's built-in math coprocessor.

Fair enough: Relatively few PC users use software that makes much use of coprocessors, and if the 486SX was destined to be the successor to the 386SX as the entry-level-PC standard, dropping the FPU was a good idea.

But a strange thing happened between the design team and the chip foundry. Intel didn't take the coprocessor out of the 486SX; it's still there—just crippled.

In other words, a 486SX and a 486DX are exactly the same, except that Intel actually spends a little more to produce the cheaper SX chip (to disable its FPU). The company can sell this chip for less than the 486DX.

Strange? You bet. Intel seems to feel that it was faster and cheaper to get the 486SX into production by simply screwing up part of the existing 486DX design; a new design, new masks, and other new tooling would have been a difficult task.

But wait; there's more. Intel believes that once you have bought a 486SX PC, you might decide you need a coprocessor after all. Intel loves add-on FPU chips, such as the 80287 and 80387 series; these have long been big money-makers for the company. Therefore, Intel graciously designed an 80487 chip for those of us who have second thoughts. (Remember, since the 486DX already has a built-in FPU, there is no aftermarket for 80487 math coprocessors to use with this chip.)

Guess what you get when you buy an 80487 FPU to use with your 486SX-based PC? A regular, full-fledged 486DX chip. That chip plugs into the math coprocessor socket right next to your 486SX microprocessor—then knocks the 486SX out of action, completely replacing it in the circuitry. You could even remove the 486SX chip from the motherboard if you wanted to, though Intel says doing so could invalidate certain guarantees on the system.



PRICE/PERFORMANCE INDEX: 20-MHz 486SX PCs

The C² Micro 486SX, Austin Winstation 486 SX, and Zeos 486SX-20C have the best performance and features, at middle-of-the-road prices.

Of the 19 486SX/20 PCs in this review, 8 have combinations of price, performance, and features that were better than the group average. The leaders were in two clusters, with the C², Austin, and Zeos units slightly ahead of those from Acma, Ares, Leading Technology, Standard, and Swan. The Dell PowerLine 420DE has better-than-average performance and features, but its price is also higher than average. Systems from ALR, American Mitac, Blackship, Everex, Hyundai, and Novacor have lower-than-average prices, but their performance was also lower than average on our tests. Even accounting for a dealer discount, IBM's entry lacks both price and performance advantages, although this chart does not factor in such intangibles as IBM's name and reputation.

Of the PCs that offer the best bang for the buck, the Austin Winstation 486 SX, C² Micro 486SX, and Zeos 486SX-20C have the best mix, even though the Zeos system suffered from a poor showing on our processor benchmark test, and the C² computer has a fine set of characteristics

but no outstanding features. At less than \$3,600 for the configurations we tested, all three systems are less expensive than average.

THE DATA POINTS

The performance/features axis of the Bang for the Buck chart is based on ten data points: the four benchmark test scores, installed RAM, disk capacity, VGA RAM, free slots, drive bays, and extras (miscellaneous items such as free bundled software, mouse, on-site service, FCC Class B certification, and extended warranty policy). A set of weighting factors has been applied to the raw numbers; you can find this data in the Software Library of PC MagNet's Editorial Forum as 22BANG.WK1.

Location on the y-axis is based on each system's tested-configuration price (as listed in the fact file). We applied a 15 percent discount to the list prices of dealer-distributed systems to approximate street prices.



See the Difference.

"Using each adapter at VGA, 800-by-600 and 1,024-by-768 pixel resolutions, all test images were displayed crisply."

-- PC Week

"The image is the brightest we've ever seen, even in the brightly-sunlit new CADalyst office."

-- CADalyst

"The intelligence built into this monitor eliminates all of the arm stretching and wheel turning so often associated with video mode changes."

-- PC Magazine

"Nanao thoughtfully places the seven most-used controls on the front of the monitor, unobtrusively tucked below the faceplate."

-- Macworld

See the difference that the industry experts agree has set the **Nanao Flexscan 9080i** apart from other monitors.

The Difference Will Impress You.

Color yourself impressed by the Nanao Flexscan 9080i's multiscanning abilities and high resolution. The 1280 x 1024 non-interlaced resolution increases productivity and enhances graphics applications beyond compare. Its high refresh rate (74Hz) is easy on the eyes. And with sharper text and brighter colors, the 9080i delivers the high quality professionals need...and want!

The Difference Will Excite You.

Get excited about doing what you've always wanted to do with Windows on the 9080i's larger 16-inch screen area. Highly compatible, in compliance with the Video Electronics Standards Association. Convergence & pin-cushioning controls. Dual inputs for two computers or two boards. The little differences that make for an exciting new monitor.



The Difference Will Comfort You.

Sometimes for high performance you need to give up creature comforts. But not with the 9080i. Sit back and relax in front of your Nanao monitor and its convenient front control panel. Almost every adjustment is within your reach. Nanao Flexscan monitors even align themselves with the Swedish MPR standards of low radiation emissions and give you an anti-static coating, fulfilling your ergonomic needs.

See the family of monitors ready for the next step in high resolution. To see the difference for yourself, contact your local Nanao dealer or call us at 1-800-800-5202.

NANAO®

NANAO U.S.A. CORPORATION
23535 Telo Avenue
Torrance, California 90505
(213) 325-5202

CIRCLE 283 ON READER SERVICE CARD

"Cutting Edge" Images created by Joe Lorentzin/Valerie Bernescut, Huntington Beach "Living Room" image created by Neolux, Pasadena NANAO and FLEXSCAN are registered trademarks of Nanao U.S.A. Corporation

Again, Intel says this is cheaper.

Rumors have spread recently that Intel is reengineering the 486SX, this time actually removing the FPU. This is true, according to an Intel spokesperson, but not because the company wants to. Vendors using the 486SX want a smaller, surface-mount chip for greater production efficiency. By removing the coprocessor and moving a few other things around, Intel can shrink the chip just enough to fit into a surface-mount design. Intel says the new 486SX will be available shortly after the first of the year.

One last bit of weirdness: Intel is planning not only a faster 25-MHz version of the 486SX but a slower one as well. That's right; Intel claims some PC vendors want to make even slower machines than the ones tested here, to underscore the entry-level positioning of the chip. They are demanding a 16-MHz 486SX, even though it costs more to go back and develop a slower part.

And you thought the crazy days in the PC business were over.

THE TALE OF THE TAPE

For our reviews, we asked PC makers for 20-MHz 486SXs with 8MB of RAM, an external processor RAM cache (if offered), a 200MB hard disk, one 5.25-inch and one 3.5-inch floppy disk drive, a Super VGA display adapter with a 14-inch color monitor, and DOS 5.0 (4.01 or 3.3 if 5.0 was not available). We accepted machines with the 486SX chip installed directly on the motherboard, and also those using a modular design (as long as customers could buy the machine directly with a 486SX processor and not only as an upgrade from a machine bought with a lower-level CPU). We insisted on machines for which certification to the FCC's tighter Class B specification for radio-frequency and electromagnetic interference emissions had been granted or was pending.

Nineteen vendors met our specs: Acer, ACMA, ALR, American Mitac, Ares, AST, Austin, Blackship, C², Dell, Ergo, Everex, Hyundai, IBM, Leading Technology, Novacor, Standard, Swan, and Zeos. Club AT sent its Falcon 486SX, but it was inadvertently omitted by *PC Magazine*.

A number of vendors weren't yet far enough along with their PC designs to apply for FCC certification and had to be dropped from this story. These include Amax Engineering Corp., Blue Star Computers, Bus Computer Systems, Eltech Research, International Instrumenta-

tion, LAN Technologies, LANtek, Lucky Computer, Matrix Digital Products, Micro Generation, Mitsuba Corp., Northgate Computer Systems, OmniTech, Peregrine Computers, Polywell Computers, Proteus Technology Corp., Reason Technology, Sureman Computer Corp., Tangent Computer, Tenex Computer Express, and TriStar Computer Corp.

Reply Corp., Samsung Information Systems America, and Twinhead Corp.



EDITORS' CHOICE

No winner:
Choose a 386/33 or 486DX

None of the 19 systems in this review deserve an Editors' Choice distinction. The 486SX category, as it exists now, fails to provide better performance than Intel Corp.'s 33-MHz 386 systems, and 486/33s still provide far better performance, often for just a little more money than 486SX systems.

The only reason you might consider a 486SX is for its upgrade potential. Once Intel begins shipping its clock-doubler CPUs (see the sidebar "More Megahertz: Intel Boosts CPU Speeds"), you will be able to make a 20-MHz 486SX run at 40 MHz by adding a new chip to the coprocessor socket found on many of the motherboards represented in this review. But that upgrade is still months from shipment, and the clock doubler is likely to be an expensive option until 1993, when Intel expects the upgrades to sell for about \$500.

PC Magazine Labs found that there are too many better-performing and better-priced systems to recommend any of the ones using a 486SX/20 CPU. This crop of 486SXs exhibited problems: In some cases (the systems from American Mitac Corp., Blackship Computer Systems, and Hyundai Electronics America), a Northport Technology cache controller chip played havoc with our memory test scores; in others (the Zeos system, for

have advertised systems that met our specifications but were unable to provide review units before our deadline. Micro Express was disqualified for sending a system that contained a 20-MHz 486SX chip but was juiced up to run at 25 MHz. Neither *PC Magazine* nor Intel recommends pushing a processor that way. Finally, Northgate withdrew its 486SX modular-processor card from the review—and from the market, Northgate claims—because of design problems.

What about performance? Not one of

instance), we saw poor comparative test results where we normally see good ones.

If you're looking for a less expensive route, choose a 33-MHz 386—a category that has endured for more than a year as one of the best mid- to high-end values. You will pay less, and you are likely to get about 10 percent faster performance from a similarly configured system. If you want real power, go for the 486/33. The speed boost will be worth the extra money—sometimes as little as \$150 to \$200.

If you are intent on purchasing the 486SX and buy into Intel's upgradability strategy, however, there are a handful of systems worth consideration. All have Intel's performance upgrade socket, which currently supports an 80487SX coprocessor and will soon allow upgrades to faster CPU speeds. They also show signs of good construction and decent value. Standard Computer Corp.'s 486SX unit was a notable performer, for instance (a 486/33 model is available for \$300 more), and the ACMA 486SX/20 proved well designed, solidly constructed, and roomy. The Austin 486/SX20 Winstation was a winner for its price, performance, and features. The systems sell for \$3,245, \$3,195, and \$3,290, respectively, but we strongly recommend paying the extra \$150 to \$300 to trade up to a 486/33.

Hot Windows Printing!



You Can Turn An HP Into A Windows Printer . . .

You've made the switch to Microsoft® Windows™ with a new computer, more memory, a faster co-processor, and new software. Now, your *computer* is much faster, but your *printer* has turned into a slow-motion nightmare. Why? Because your HP® LaserJet® was made for DOS, not Windows.

Fast Windows Printing

That's why LaserMaster™ invented the WinPrinter,™ the only laser printer in the industry specifically designed to work with Windows.* The WinPrinter's intelligent software and revolutionary hardware design tap into the unused power of your '386 or '486 for lightning fast printing. Our direct Windows printer driver gives you the fastest Windows printing in the industry. (We're talking complex pages in seconds, not minutes.) Plus, you get full PostScript® and HP LaserJet PCL printing as well.

But the WinPrinter gives you more than just speed. While Windows makes it easy to add powerful charts and graphics to all your documents, the WinPrinter makes sure they print crisp and sharp. At either 400 or 800 dpi, LaserMaster's WinPrinters give all your documents the quality look they need to make a professional, lasting impression.

Upgrade Your HP to 800 dpi

Best of all, you can get the WinPrinter's amazing speed and performance from your current laser printer. The WinJet 800 upgrade kit installs quickly and easily to



Or Buy A Printer Made For Windows.

turn your slow-motion HP LaserJet into a fast, 800 dpi, high-quality WinPrinter. And with a special introductory price of just \$995, there's simply no better solution to your Windows printing problems.

Choose Your WinPrinter

If it's time for a whole new Windows printer, the WinPrinter 400 or the WinPrinter 800 is the printer for you. For only \$1995, the WinPrinter 400 gives you 400 dpi output that's almost twice as sharp as output from a standard laser printer. The WinPrinter 800 prints all your text and graphics with 800 dpi resolution never before seen from a business printer and costs only \$2795. And with 50 premium Type 1 fonts, the WinPrinter solution will make your Windows documents really come to life.

Call today for more information about how you can add a fast, affordable WinPrinter to your Windows computing system:

**1-800-365-4646, or
1-612-944-9330.**

**Dept. #
011**



More: Speed, Fonts & Resolution

* Recommended system requirements: '386 or '486, 8 Mb RAM, and printing primarily from the Windows environment. ©1991. LaserMaster Corporation, 6900 Shady Oak Road, Eden Prairie, MN 55344. The LM logo is a registered trademark, and LaserMaster, WinJet, and WinPrinter are trademarks of LaserMaster Corporation. Microsoft is a registered trademark and Windows is a trademark of Microsoft Corporation. PostScript is a registered trademark of Adobe Systems Incorporated. Hewlett-Packard, HP, and LaserJet are registered trademarks of Hewlett-Packard Company. All other product names or brand names are trademarks or registered trademarks of their respective holders. Specifications and availability subject to change.

CIRCLE 195 ON READER SERVICE CARD

these 486SXs matched the average raw computing performance of the 100-plus 33-MHz 386 PCs tested by PC Labs so far. The 486SXs took about 10 percent more time to complete our processor test than the 386/33s we have tested over the past two years. Since this test shows how the CPU operates with the associated bus design, system memory, and motherboard architecture, it is a good computing/performance index.

In other areas, these 486SXs looked slightly better, possibly because disk and video technology have improved over the past year or two. Vendors are typically shipping faster hard disks and faster video boards than we have seen in 386/33s. Raw, uncached DOS File Access test times for these 486SXs were nearly 15 percent less than those of the 386/33s. On the video tests, we saw a similar ratio of results.

We also ran our disk test a second time, with a 2MB software disk cache enabled. We did not report the results, however, because the software (most frequently SMARTDRV.SYS, found in DOS 5.0 and *Microsoft Windows 3.0*) masked hardware deficiencies, and because sys-

tems using the same software cache performed similarly, regardless of the hardware.

THE CACHE MACHINE

Though the 486SX chip has an on-board 8K cache, some vendors add external secondary processor caches of up to 256K. Though in general the secondary processor caches contributed to better performance on processor-based tests, we ran into problems with three machines that use a new SC82C346 cache controller chip from Northport Technology.

Rather than the better-performing set-

associative cache design, Northport uses a direct-mapped cache architecture. The Northport chip-equipped machines use a 64K cache; in other words, at any given moment, the cache contains a 64K portion of the main-memory contents.

If all the data sought can be retrieved from that single 64K block, everything is fine; but if a program requests data from two or more blocks, the Northport direct-mapped cache system begins thrashing—constantly looking in the cache, failing to find the needed information, going to memory for the information, reloading the cache, and repeating that cycle over and over.

By contrast, set-associative cache designs allocate two or more cache locations for corresponding main-memory page locations and are thus more likely to be able to fill a request from data already in the cache.

Northport argues that a larger cache, such as 256K, will improve performance. It will. Unfortunately, the Ares, Blackship, and Hyundai (and Northgate) machines tested with the Northport chip have external processor RAM caches

Though the 486SX chip has an on-board 8K cache, some vendors add external secondary processor caches.

Is your view of 3Com and

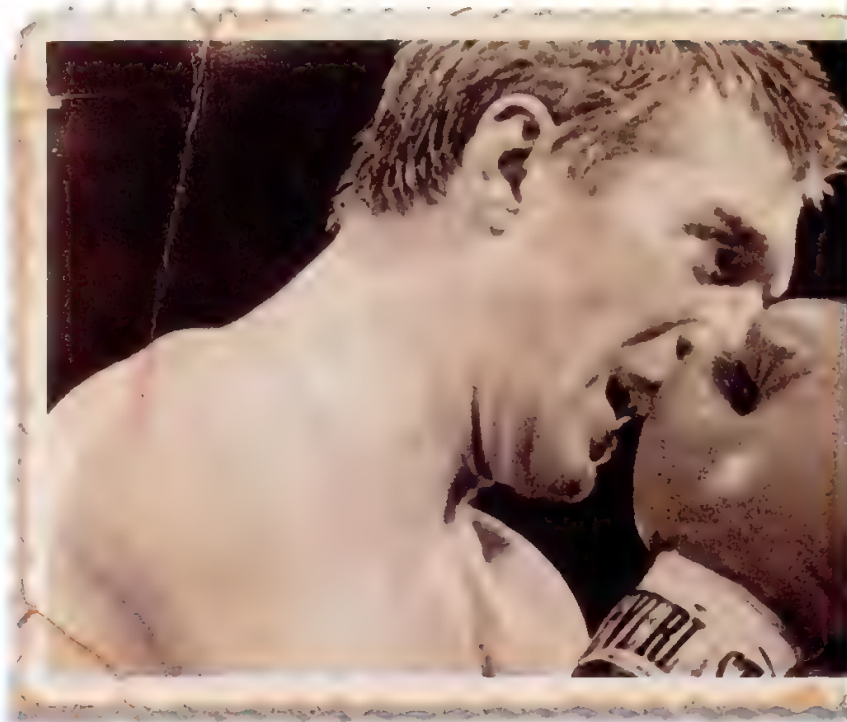
A funny thing happened in the fight between 3Com and Novell.

We became friends.

So friendly, in fact, that we share product information with each other to boost performance. And follow through in the field with service technicians trained at both companies.

Which puts you at a decided advantage when it comes to choosing products for NetWare®. Because now you can choose 3Com®.

The new NW1000™ and NW1000-TP adapters, for example, are specially tuned for NetWare. They come complete with drivers and software for NetWare and are installed in less than five minutes. At a price that makes your budget hum with



no larger than 64K. (Note that the Blackship, Hyundai, and Northgate systems used the same upgradable motherboard as well.)

FOR WHAT, FOR WHOM?

One of the most interesting questions about these first 486SX machines is just what job they are intended to perform, and for whom. Are they intended to be low-end servers? Middle-to-high-level individual workstations?

From our tests, we would consider them poor choices as network servers, where 32-bit buses—found on only the Extended Industry Standard Architecture (EISA) ALR, American Mitac, and Dell machines and the Micro Channel architecture (MCA) IBM systems—and fast access hard disks can be extremely important. Cutting corners on server performance is rarely a good idea, especially when better performance is available from 33-MHz 386 PCs than from these machines for less money.

As individual workstations? Maybe, but once again, why pay more for less?

If you want a best-buy workstation,

**If you think the 486SX
will repeat the
success of the 386SX
chips, you are
probably wrong.**

look at an up-to-date 33-MHz 386DX machine with fast hard disk and video times, or go all the way, spend \$200 to \$300 (or more), and get a 33-MHz 486DX machine, which offers as much as 40 to 45 percent reduction in processor times.

Especially for the kinds of work most likely performed on a high-level individual workstation—graphics, desktop publishing, statistical analysis, and other math-intensive chores—the 486DX's built-in floating-point unit will quickly pay for itself. Adding the bizarre 80487 FPU chip to a 486SX box makes little economic sense.

SORRY, BUT...

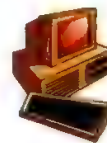
If you've been looking at 486SXs with a covetous eye, dreaming of entering the world of power computing, you will be disappointed. And if you think the 486SX will repeat, on a higher-performance plane, the success of the 386SX chips, you are probably wrong. When we set out to examine the first 486SXs, we did not intend these reviews to be downers. In fact, many of the systems are well constructed and feature-rich.

The problem is that similarly configured 386/33s do a better job. When you see the numbers, we think you will agree that this class of machines is destined to become The PCs That Time Forgot.

ACER AMERICA CORP.

AcerPower 486SX

by Ed Perratore



The AcerPower 486SX, from Acer America Corp., features a motherboard designed to offer a number of options. For starters, the motherboard can accept 98MB

Novell a little outdated?



satisfaction. And they are just two of 12 adapters from 3Com that can be used with NetWare.

Moreover, 3Com's NETBuilder® family of bridges and routers can help you connect NetWare LANS with each other and to your corporate network, in the simplest possible way.

So why not visit your 3Com or Novell reseller today? Or call 3Com directly at 1-800-NET-3Com. And see how your network can really come out punching.



© 1991 3Com Corporation. (408) 764-5000. 3Com, NW1000 and NETBuilder are trademarks of 3Com Corp. Novell and NetWare are trademarks of Novell, Inc.

CIRCLE 293 ON READER SERVICE CARD

MORE MEGAHERTZ: Intel Boosts CPU Speeds

by Michael Slater

The 486SX cries out loudly for a speed boost, and Intel Corp. is responding with a barrage of new products for both the 486DX and the 486SX lines.

Intel will introduce faster and slower versions of its 386SL, 386SX, 486DX, and 486SX CPUs, though it won't be doing this for its 386DX line. While Advanced Micro Devices (AMD) is shipping 40-MHz 386DX chips, Intel is trying to squeeze out the 386DX and emphasize the company's other processors, such as new 16-MHz and 25-MHz versions of the 486SX chip.

More significant than simple clock speed upgrades are the new "clock-doubler" 486-family chips Intel will introduce in a variety of flavors. These microprocessors have an on-chip phase-locked loop (PLL) that doubles the speed of the clock input. A clock-doubler processor plugged into a 25-MHz system will run at 50 MHz internally. The on-chip cache satisfies most memory requests, and for these accesses the chip runs at the full 50-MHz rate. When a cache miss occurs or an input/output operation is required, the chip effectively slows down to 25 MHz. The system therefore is not as fast as a system with a true 50-MHz 486DX CPU, but it will be significantly cheaper than a 50-MHz system and faster than a 25-MHz system.

These 486DX and 486SX chips will be sold with a variety of clock rates, including 20 and 40 MHz, 25 and 50 MHz, and 33 and 66 MHz. At this point, there are no plans to double the speed of the 486DX/50.

The clock-doubler chips will also come in two packages. One will be pin-compatible with the standard 486DX,

While the industry awaits the next-generation P5 processor, Intel's improvements on current chip designs promise a clock speed for every need.

and the other will plug into the performance upgrade socket currently designated for the 487SX chip. The socket could find its way onto future 486DX motherboards as well.

The 486DX-compatible version will be sold primarily to system manufacturers, while the upgrade-socket version will be sold primarily through retail channels. For the first time, you will be able to increase system performance sig-

nificantly (by perhaps 50 percent less time) simply by installing a new microprocessor chip. By 1993, Intel projects, a 50-MHz clock-doubler chip will sell for about \$500.

The P5 (or 586) is the only completely new 386-family microprocessor expected from Intel in 1992. It will be superscalar, which means that more than one instruction can be decoded, dispatched, and executed during each clock cycle. It will have two integer units and a floating-point unit, allowing it to perform two integer instructions at the same time as a floating-point instruction.

The P5's on-chip caches will be at least twice the size of the 486's 8K cache, and they will include much better support for multiprocessor systems. Intel has announced that performance will be about twice as fast as the 486 on integer programs and as much as six times as fast on floating-point operations.

Some extensions to the instruction-set architecture will also be included, but for the most part the P5 will be a faster implementation of the 386 architecture. Any radical breaks with the past will be saved for the generation beyond the P5, which probably won't come out until 1994.

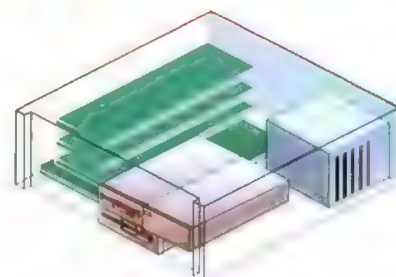
Acer's well-planned design does not come cheap, though it has its own niche in Acer's product line.

of RAM without resorting to a daughter-board; it also contains the I/O, mouse, and keyboard ports, along with the controllers for the hard disk and floppy disk drives. Additionally, it has sockets and clock crystals for upgrades to 25- or 33-MHz speeds with either the 486SX or the full 486DX.

This well-planned design does not come cheap, though it does have its own niche in Acer's product line. Our \$6,001 standard configuration included 8MB of RAM, a 64K processor RAM cache, a 200MB IDE hard disk, 1.2MB and 1.44MB floppy disk drives, a 1,024-by-768 noninterlaced monitor with a 60-Hz vertical refresh rate, and ACACHE disk-caching software. A 386/33 with a somewhat smaller cache sells for \$5,753, and a 486/33 with the same configuration as the 486SX sells for \$7,001.



FACT FILE



AcerPower 486SX

Acer America Corp., 401 Charcot Ave., San Jose, CA 95131; 800-733-2237, 408-922-0333.

List price (tested configuration): \$6,001.

Memory and processor RAM cache: 8MB 80-ns. SIMMs, 64K cache.

Disk drives and controller: Maxtor 15-ms. 200MB IDE hard disk, 1.2MB and 1.44MB floppy disk drives.

Display: Acer 1,024-by-768 adapter with 512K RAM, Acer 14-inch monitor.

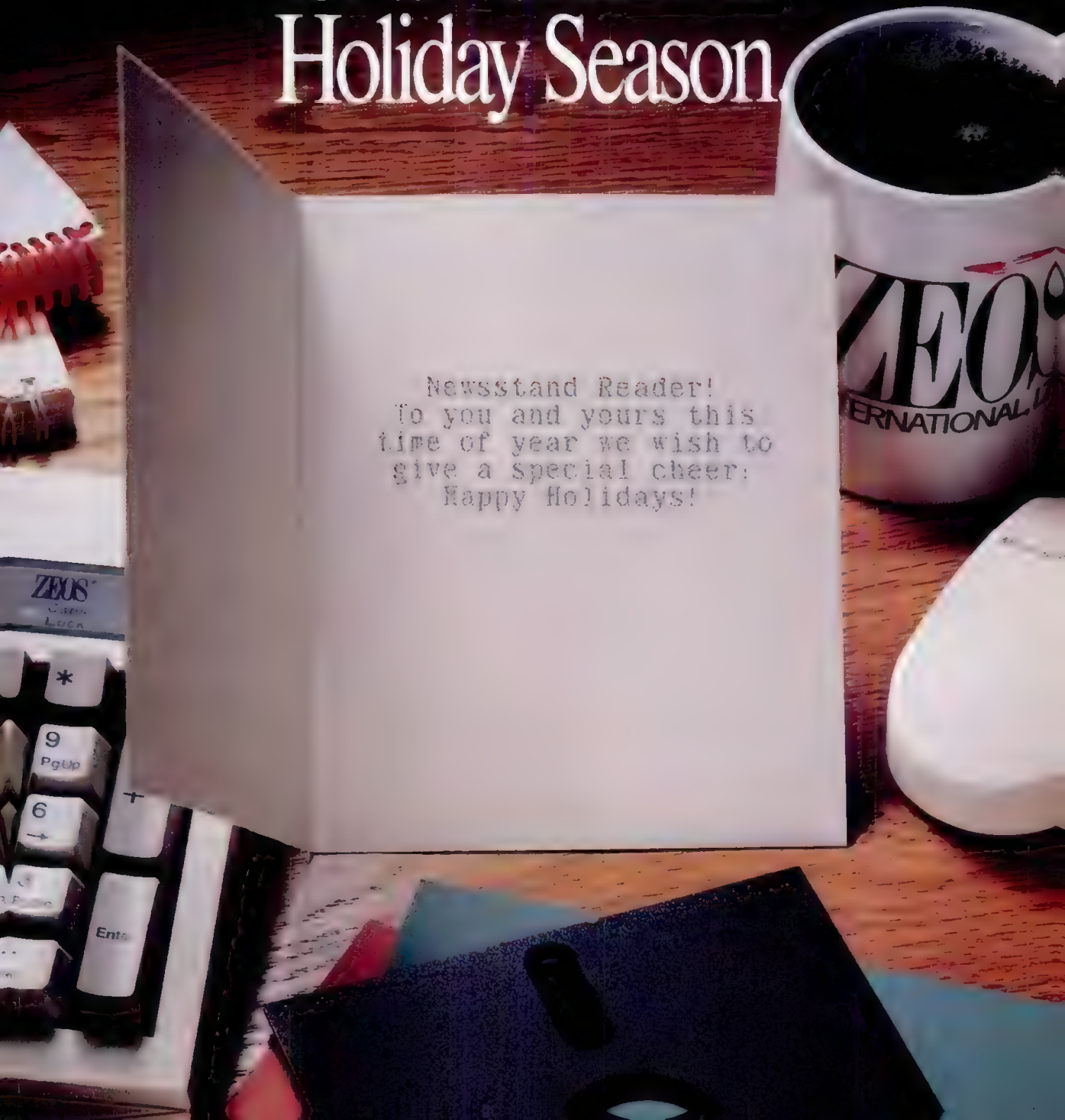
Monitor refresh rate: 60 Hz.

Software: ACACHE, DOS 5.01, Microsoft Windows 3.0.

CIRCLE 400 ON READER SERVICE CARD

ZEOS® sends Best Wishes for a Wonderful Holiday Season

Newsstand Reader!
To you and yours this
time of year we wish to
give a special cheer:
Happy Holidays!

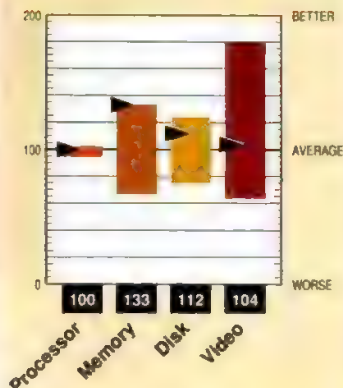


AcerPower 486SX



In Short: The AcerPower 486SX offers generous processor and coprocessor upgradability, and you can expand the memory to 98MB. Other facets of the machine demonstrate both good and questionable planning, although the model's weaker points—the curious performance of its proprietary *ACACHE* disk-caching software, a left-handed mouse port, and a two-drive-bay 5.25-inch drive installation—are hardly enough to turn away buyers. The \$6,001 price might, though.

▶ TEST RESULTS



The AcerPower's four 16-bit expansion slots are mounted on a T-bar connector that holds the boards horizontally. Although all these slots are full-length, Acer does not recommend installing a full-length board in the bottom slot. Try it and you will find that the board catches on wires, scrapes the top edge of your SIMM banks, and prevents the heat from ventilating. You can easily install a half-length card in that slot, however.

Motherboard RAM is expandable up to 98MB, using 4MB SIMMs. The motherboard accepts either an 80487SX or a Weitek 4196 coprocessor. Controller and I/O functions are integrated on the motherboard, but the video chip set is on a plug-in card that connects flush with the motherboard.

The drive bays accommodate four 1.44MB drives, three of which are accessible from the front. It's possible to install a 1.2MB drive, but doing so will leave an almost useless 2-inch space in the 7-inch bottom bay. Acer does provide a plate to close the gap, but the bay seems to be intended primarily for two snugly fitted 1.44MB drives.

The AcerPower's benchmark test scores were nothing to frown at. It was an average performer on the processor test, but its video test result was above average. Its performance on the memory test was outstanding; the AcerPower tied for first place with three other machines.

Some peculiar results marred the disk test performed with Acer's proprietary *ACACHE* software. On most tasks, the AcerPower tested slower with its caching software loaded than without—an anomaly Acer said it could neither explain nor duplicate on its own tests. You may wish to use SMARTDRV.SYS instead.

Acer provides first-rate documentation and offers a two-year parts-and-labor warranty. If the dealer cannot fix a particular problem, you can mirror-ship the machine to Acer. Acer's toll-free number is not available to end users, however.

With the AcerPower 486SX, Acer has clearly attempted an innovative design with hearty expansion options for motherboard RAM. None of the product's drawbacks are serious, except the price.

ACMA COMPUTERS INC. ACMA 486SX/20

by Ed Perratore

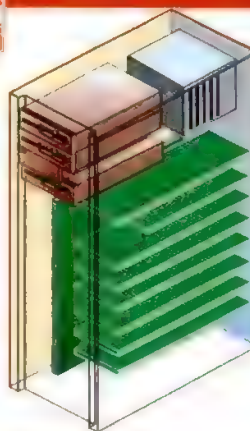


Who says you need above-average prices for above-average performance? The ACMA 486SX/20, from ACMA Computers, is a good example of why mail-order PC companies have grown in popularity.

In the standard configuration specified for this review—8MB of RAM, a



FACT FILE



ACMA 486SX/20

ACMA Computers Inc., 48501 Warm Springs Blvd., Fremont, CA 94539; 800-456-1818, 510-623-1212.

List price (tested configuration): \$3,195.

Memory and processor RAM cache: 8MB 70-ns. SIMMs, 64K cache.

Disk drives and controller: Quantum 15-ms. 210MB IDE hard disk, 1.2MB and 1.44MB floppy disk drives.

Display: Orchid 1,024-by-768 adapter with 1MB RAM, Seiko 14-inch monitor.

Monitor refresh rate: 72 Hz.

Software: DOS 5.0, Microsoft Windows 3.0, SMARTDRV.SYS.

CIRCLE 410 ON READER SERVICE CARD

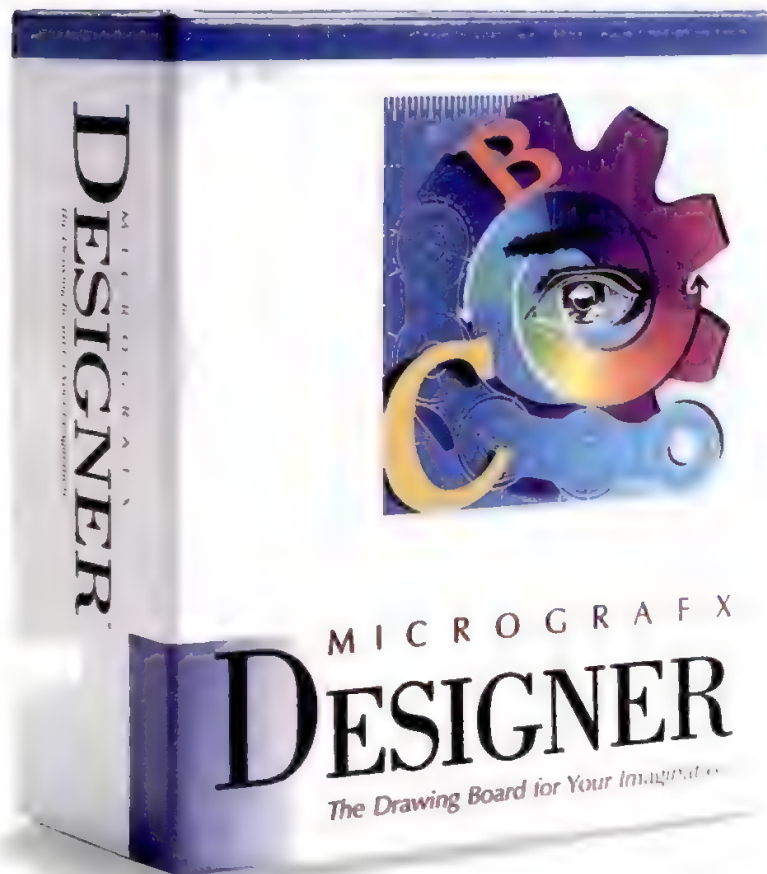
64K processor RAM cache, a 210MB hard disk, and 1,024-by-768 video resolution—the ISA-bus ACMA sells for \$3,195. The machine we reviewed came with an Orchid ProDesigner IIs adapter that had 512K of RAM, and a Seiko SII CM1450 noninterlaced Super VGA monitor, which had a 72-Hz vertical refresh rate.

A basic configuration of 4MB of RAM, a 105MB IDE hard disk, 1.2MB and 1.44MB TEAC floppy disk drives, a Super VGA video adapter and monitor, DOS 5.0, Microsoft Windows 3.0, and a mouse is available for \$2,495 in a desktop case. This configuration comes with a noninterlaced ACMA Super VGA adapter and an interlaced Hyundai XGA monitor. Ordering the Orchid/Seiko combination raises the \$2,495 base price by \$380 to \$2,875.

Mini- and full-size towers cost \$50 and \$75 more than desktops. The mini-tower we tested had four standard-height 5.25-inch disk drive bays, three of which were accessible from the front.

The unit's I/O ports, 64K processor RAM cache, and a socket for a Weitek 4167 coprocessor (though not the Intel 80487SX) are located on a proprietary 32-

HEFTY HEFTY HEFTY



WIMPY WIMPY WIMPY



Want to play around? Get Corel Draw. But if your *work depends* on precision drawing, you should realize just how much more you can accomplish with Micrografx Designer."

Important things. Like putting up to 64 layers in your drawings. "Snapping" objects to align them perfectly. And editing drawings on the full screen, in color, instead of a wimpy black-and-white box.

"Designer is the power user's choice."
PC Magazine
"Editor's Choice"

Then there's Designer's poster-size 132" by 132" drawing area. Corel's is a mere 17" by 17" – leaving you to strip pieces together for larger drawings.

And don't forget clip art. Designer is

packed with over 1,700 ready-made illustrations. Corel, only 750.

If you have questions about using Designer, you can turn to help screens or our 24-hour telephone support. But you won't find any help screens in Corel Draw. And don't bother to call them after hours.

Features	Designer	Corel Draw
Drawing layers	64	1
Dimensioning	Yes	No
Object snap	Yes	No
Maximum drawing size	132" x 132"	17" x 17"
Edit in full color	Yes	No
Clip art images	Over 1,700	750
Named symbols	Yes	No
PageMaker 4.0 filter	Yes	No
On line help screens	Yes	No
24 hour support	Yes	No

The experts' verdict:
"No contest."

Software Digest gave Designer five stars to Corel's three, concluding: **"Designer provides the best overall free-form graphics package. It offers state-of-the-art features, good performance, and unmatched ease of learning and use in a sophisticated package."**

Why waste your time with a wimpy product when you can really flex your muscles with Designer? Call us today for a *free* working model, or for the location of the dealer nearest you.

M I C R O G R A F X[®]
1-800-755-5940

Perhaps the most amazing PC is that it can



At NEC, we put as much emphasis on affordability as we do on upgradability. Add a Pinwriter® P3200 and a MultiSync 3FGx to your Image Series PC and you can do high-level computing without paying a high price.



C&C

Computers and Communications

Anyone who thinks you can't do anything with a quarter these days obviously hasn't seen NEC's new PowerMate® Image™ Series SX/16i and SX/20vi PC's. With their tool-less design, all it takes to open them is the quick turn of a quarter. Then you can customize your computer yourself as your needs change. For instance, you can increase your system or video memory by just plugging in chips. And storage devices easily snap into place, too. We've even made it easier to upgrade your system in the future. Simply send us your old Image motherboard and we'll credit

PowerMate, MultiSync and Pinwriter are registered trademarks and ImageSeries and P&I are trademarks of NEC Technologies, Inc. MS-DOS and Windows are registered trademarks of Microsoft Corporation. PPS Windows Media is a trademark of Spinnaker Software Corp.

zing thing about our \$1,199* be upgraded with a quarter.

its value towards a new one.** And we don't just give you a faster CPU, either. We can give you more memory, cache and video, as well. But that's not all.

There's also space for additional drives.

So you have room

for new technologies

like CD-ROM. And

like the rest of

our Image Series

PC's, the

SX/16i and

SX/20vi

come with

plugs and

jacks that

make them

multimedia

ready. There's

ImageSync™ tech-

nology for flicker-free

graphics when used with our

new MultiSync® FG™ monitors.

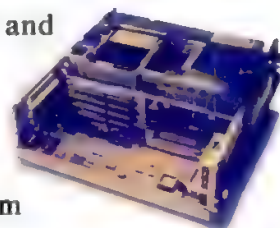
FLASH ROM for upgrading or enhanc-

ing your BIOS via diskette. And pre-loaded

MS-DOS® 5.0, Windows® and PFS: Window Works.™ For more

information, call 1-800-NEC-INFO, or NEC FastFacts at 1-800-366-0476, #IMAGE

(46243). After all, a computer isn't worth a dime unless you can upgrade it with a quarter.



Because  is the way you want to go.

NEC

Intel is a registered trademark and the Intel Inside logo is a trademark of Intel Corp. © 1991 NEC Technologies, Inc. *Manufacturer's suggested retail price for the PowerMate SX/16i MSRP for 386DX is \$1,199.00. **See your dealer for complete details.

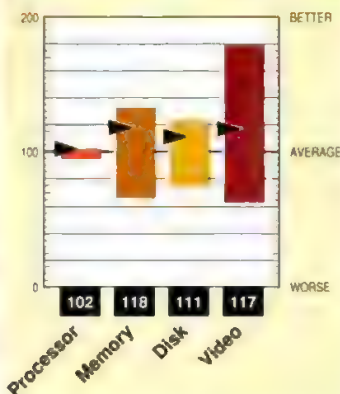
CIRCLE 730 ON READER SERVICE CARD

ACMA 486SX/20



In Short: The ACMA 486SX/20 is not an innovation in terms of design and features, and its processor is not upgradable. But the model we tested offers above-average performance and a solid set of components—including a Quantum hard disk and Orchid ProDesigner IIs video adapter—for a very reasonable price of \$3,195. The documentation could be more cohesive, but the company's technical support is reliable.

TEST RESULTS



bit add-in board. A total of 32MB of memory can fit on the motherboard.

Many vendors now assume that most

of your cards are third- or half-length; accordingly, these cards block off full access to certain expansion slots. This is not

the case with ACMA's mini-tower, whose drive bays are located above the path of the boards. ACMA has also spaced the SIMM banks so that you could put a full-length card wherever you please.

The ACMA performed just a shade above average on our processor test, though its memory test score was considerably better than the average for the group tested. The hard disk included with our unit, a 210MB 15-millisecond drive from Quantum, placed in the upper third among the disks tested. On our video test, the ACMA again ranked among the top third.

ACMA's documentation is a compilation of various component manuals, with little tying the whole together. If you do run into trouble, ACMA's toll-free technical support operates from 7:00 to 6:00 P.S.T. A one-year parts-and-labor warranty is standard, and ACMA will mirror-ship anything that needs to be repaired.

If you are committed to buying from this product category, the least you can do is get a solid product at a reasonable price. The ACMA 486SX/20, while not upgradable to a higher class of processor, nevertheless fits squarely within that description.



"Only PrintDirector gave us a cost-effective solution for every size work group & wiring configuration in our company."

Now make everyone who shares printers grin from ear to ear.

Send for your free white paper. Get the story on the only manufacturer with a full range of models and wiring options to solve all your peripheral sharing problems. See why PrintDirector — with 600,000 users worldwide — was the '91 winner of PC Magazine's Editors' Choice award.

Discover how to print at up to 100,000 BPS using PrintDirector. And print right the first time — every time. For a price that will make you happy.

Flexible
Printer
Sharing
Solutions

FREE

"PrintDirector lets us print our graphics applications in about half the time of other products."

For your free white paper, free catalog and "Keep 'Em All Smiling" guarantee certificate, call:

1-800-243-2333 Ext. 98 (in MA 617-647-1234)



**DIGITAL
PRODUCTS, INC.**

the leader in printer sharing

411 Waverley Oaks Road, Waltham, MA 02154

PrintDirector is a registered trademark.



Printer sharing with PrintDirector is guaranteed to keep everyone smiling.



"With PrintDirector's easy file transfer capabilities, we saved a small fortune by not buying a LAN."



"Just plug it in and forget about it. PrintDirector feels like you're using a dedicated printer."



Unleash Your LAN
With a REAL Line Printer

THE WORLD'S QUIETEST LINE PRINTER!

EUROLINE™

FINALLY! A LINE PRINTER SO QUIET
YOU CAN PUT IT RIGHT IN THE OFFICE.

- ▶ 48 DBA* (QUIETER THAN A LASER) AT 400 & 600 LPM
- ▶ LOWEST MAINTENANCE COST IN THE INDUSTRY

CALL US FOR A FREE BROCHURE AND ARRANGE
FOR A PERSONAL DEMONSTRATION.

800-468-8788

E 9922 MONTGOMERY DRIVE, SUITE #6, SPOKANE, WA 99206-4199

* RATED NOISE LEVEL OF 48DBA IS AVAILABLE AS AN OPTION. STANDARD RATED NOISE LEVEL IS 53DBA

CIRCLE 16 ON READER SERVICE CARD

OTC OUTPUT
TECHNOLOGY
CORPORATION
Printing
Solutions For
Business Critical Applications



DOS 5.

There's no doubt about it. DOS 5 is the sleekest, most convenient, most powerful DOS upgrade in history.

And it's a great place to start if you really want to get the ultimate in PC performance—without even lifting a finger.

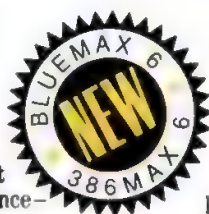
New MAX 6—the driving force in automatic memory management.

Top performance requires as much conventional memory as possible. So applications can run faster. And so you can load Windows, TSRs, even a network, and have memory to spare.

Of course, DOS 5 helps with its smaller program size. And it does let you load programs high—if you want to do it by hand.

But for optimal memory management that's totally automatic, you need new MAX version 6—386MAX® for PC compatibles, and BlueMAX™ the only memory manager designed to recover up to 250% more high DOS memory on IBM PS/2s.

They're the dramatically advanced versions of the fastest growing brand of memory managers in the world. Now with better memory recovery, superior optimization, and amazing ease of use.



Intelligent, thoughtful, and totally reliable.

Just type *maximize*, and MAX takes over with its automatic memory management tools.

Like new 386MAX ROMsearch™ that recovers massive holes of unused system BIOS memory. New 386MAX VGAswap™ that creates more contiguous memory on all VGA/EGA systems.

Like SmartMemory™ that takes care of memory allocation for you, so you'll never again have to think about what kind of memory your computer needs. And new Maximize Reordering that helps fit more programs into high DOS by automatically arranging programs for optimal loading, every time.

And using MAX 6 is a cinch thanks to the new graphical interface, complete with pull-down menus, mouse support, and context-sensitive help. There's even a new improved version of ASQT™ the intelligent system analyzer and tutorial, right on board.

The ultimate in power and luxury is more affordable than ever.

New 386MAX 6 for 286*, 386, and 486 PC compatibles is now just \$99.95. And new BlueMAX 6 for 386 and 486 IBM PS/2s is only \$124.95.

Frankly, whether you use DOS 5 or not, only MAX 6 will have you on your way to maximum PC performance with an absolute minimum of effort.

See your dealer or call toll-free today.

1-800-676-0386

Call to upgrade for just \$29.95 plus \$5 S&H.**



The Intelligent Memory Managers™

©1991, 1992 Qualitas. Qualitas, 7101 Wisconsin Avenue, Suite 1386, Bethesda, MD 20814. All company and product names are trademarks or registered trademarks of their respective owners. System Requirements: Any 386 or 486 PC or PS/2, min. 256K of extended memory, DOS 3.0 or higher, and hard disk drive. *386MAX supports 286 systems with Shadow RAM. Feature availability and memory recovery may vary. **Offer valid in North America only.

QUALITAS®



20-MHz 486SX-BASED PCs: SUMMARY OF FEATURES

List price (standard configuration) For this review of 20-MHz 80486SX computers, we requested a standard configuration that included 8MB of RAM, a 200MB hard disk, two floppy disk drives, a Super VGA color display subsystem, one parallel and two serial ports, and DOS 5.0. All 19 PCs reviewed provide a reasonably close match to this list of requirements.

The price of the standard configuration is followed by the **standard hard disk capacity**. Unless otherwise noted, all table entries refer to the range of options available in the systems reviewed.

Distribution channel Some machines are sold directly through mail order, others through dealers. Dealers have previously offered discounts of 25 percent or more off the list price; however, an industry-wide price restructuring has cut these discounts in many cases. *PC Magazine* views a 15 percent discount as typical.

Bus architecture Sixteen-bit Industry Standard Architecture (ISA) buses are prevalent in this category. Extended Industry Standard Architecture (EISA) and Micro Channel architecture (MCA) allow 32-bit transfers.

Chip set manufacturer indicates which company makes the support logic that connects the CPU with the other functions managed by the system board.

Shadowing Shadow RAM is a technology that loads system BIOS or video BIOS directly into fast RAM on boot-up of the computer, offering enhanced performance speed. It uses a segment of system memory located between the boundary of conventional memory (640K) and the end of the first megabyte of installed RAM.

The BIOS version can affect PC Magazine Labs' benchmark test results. Those purchasing the same machine with a different BIOS version may encounter some variations in performance.

Flash EEPROM An EEPROM chip (electrically erasable programmable ROM) contains BIOS code that can be updated via software. The BIOS is generally stored in conventional ROM, which has no provision for modification.

Installable RAM indicates the minimum and maximum amount of memory that can be installed using any combination of chips and proprietary cards.

Drive bays Accessible drive bays can be reached from the system's front panel and can support removable media (such as tape and CD-ROMs); internal drive bays can be reached only by opening the case. We report the maximum number of accessible and internal drives the system can hold.

Disk controller location A computer with IDE (integrated drive electronics) circuitry has its controller functions integrated into the drive and motherboard.

Hard disk options We report the range of hard disk capacities the vendor offers.

Minimal floppy disk drive configuration indicates whether the vendor equips its base-priced system with a 1.2MB floppy disk drive, a 1.44MB floppy disk drive, or both.

Expansion bus For each type of expansion slot—8-bit, 16-bit, 32-bit EISA/MCA, and 32-bit proprietary—we report the number of slots on the motherboard and the number of slots left open when the PC is equipped in our standard configuration.

Display mode refers to the resolution of the video card that comes in the tested configuration. For this review, we requested a Super VGA display (800 by 600 pixels), though we accepted 1,024-by-768 resolution as well.

The **display circuitry** can reside on an expansion card or on the motherboard. Motherboard circuitry is often faster, but if it cannot be disabled there is no way to upgrade it.

Number of device connectors indicates how many internal storage devices the power supply can support without requiring Y cables (power splitters).

DOS versions and prices are listed here. If no price is given, the base-priced system includes DOS. (*PC Magazine's* standard configuration includes DOS 5.0—4.01 or 3.3 if 5.0 is not available—to allow more-accurate price comparisons.)

Other bundled software is software that comes with the system at no extra charge. This category includes disk-caching software (such as SMARTDRV.SYS), expanded memory management software (such as QEMM), *Microsoft Windows* 3.0, and any applications the vendor supplies as extras.

FCC Class B Identification number Systems with a Class B rating from the Federal Communications Commission can be purchased for home use. Public Access Link, the FCC's bulletin board service (301-725-1072), lists every Class B system by its FCC identification number.

CONTINUES

ADVANCED LOGIC
RESEARCH INC.ALR BusinessStation
486ASX

by Tom Unger



Although Advanced Logic Research's ALR BusinessStation 486ASX matches the company's usual high standards of

design and quality, this upgradable EISA machine suffers from a higher-than-average price, a slower-than-average video benchmark test score, and limited expansion capabilities.

The BusinessStation lists for \$4,788 with 9MB of RAM, a 120MB hard disk, a 1.44MB floppy disk drive, a Super VGA color display subsystem, and DOS 5.0, but without *Microsoft Windows* (the RAM is expandable to 33MB on the motherboard). With a maximum resolution of

1,024 by 768, the unit's 14-inch noninterlaced FlexView 2X Super VGA monitor has a 72-Hz refresh rate. A 200MB hard disk was not available when we tested, but ALR assures us that it will be shipping by the time you read this, at a premium of \$106 over the system we tested. Since the company sells through dealers, you can shop for the best discount.

It makes sense to buy the BusinessStation with the larger hard disk for two reasons. First, you will nearly double your

486SX-BASED PCs: SUMMARY OF FEATURES

Products listed in alphabetical order by company name

	AcerPower 486SX	ACMA 486SX/20	ALR BusinessStation 486ASX	American Mitac 4270E	Ares 486-20SX Sonic
List price (standard configuration)	\$6,001.00	\$3,195.00	\$4,993.00	\$4,565.00	\$3,450.00
Standard hard disk capacity	200MB	210MB	200MB	200MB	210MB
Distribution channel	Dealers	Direct	Dealers	Dealers	Direct
Bus architecture	ISA	ISA	EISA	EISA	ISA
Case type	Small-footprint	Mini-tower	Slimline	Small-footprint	Desktop
MOTHERBOARD					
Motherboard manufacturer	Acer	Micronics	ALR	Mitac	Technology Power
Chip set manufacturer	C&T	Micronics/C&T	ALR	Intel	Technology Power
System shadowing/Video shadowing	■/■	■/■	■/■	■/■	■/■
Upgradable processor	■	□	■	□	■
BIOS version	Acer 1.2R3	Phoenix 0.10 G12	Phoenix 1.00.12A	Phoenix 1.00	AMI (March 1991)
Flash EEPROM	□	□	□	□	□
Supports 80487/Weitek coprocessor	■/■	□/□	■/■	□/■	■/■
MEMORY AND PROCESSOR RAM CACHE					
Installable RAM	2MB-98MB	4MB-32MB	1MB-33MB	1MB-64MB	1MB-64MB
Cache controller	Acer	Discrete logic	ALR Cachepak	Proprietary	Technology Power
Installable RAM cache	64K-256K	64K-256K	8K-256K	64K-256K	64K-256K
DISK DRIVES					
Accessible drive bays	One 5.25-inch, one 3.5-inch	Three 5.25-inch, no 3.5-inch	One 5.25-inch, one 3.5-inch	Two 5.25-inch, one 3.5-inch	Two 5.25-inch, two 3.5-inch
Internal drive bays	1	1	1	1	2
Disk controller location	Integrated	Integrated	Integrated	Integrated	Integrated
Hard disk options	40MB-200MB	53MB-660MB	80MB-200MB	20MB-1.2GB	52MB-660MB
Minimal floppy disk drive configuration	1.44MB	1.2MB, 1.44MB	1.44MB	1.2MB	1.2MB, 1.44MB
EXPANSION BUS					
8-bit slots	None	1 (open)	None	None	None
16-bit slots	4 (4 open)	6 (3 open)	1 (open)	None	7 (5 open)
32-bit EISA/MCA slots	None	None	2 (open)	5 (4 open)	None
32-bit proprietary slots	None	1 (none open)	2 (1 open)	1 (none open)	1 (open)
Parallel, serial, mouse ports on motherboard	1, 2, 0	None	1, 2, 1	0, 0, 1	None
VIDEO					
Display mode (tested configuration)	1,024 x 768	1,024 x 768	800 x 600	800 x 600	1,024 x 768
Display circuitry location	Motherboard	Card	Motherboard	Card	Card
Chip set manufacturer	ATI	Tseng	Western Digital	Western Digital	Tseng
POWER SUPPLY					
Power supply (watts)	145	250	150	199.1	200
Number of device connectors	4	5	4	5	6
SOFTWARE					
DOS	5.0	5.0	5.0 (\$99)	4.01	5.0
Other bundled software	ACACHE, Microsoft Windows 3.0	Microsoft Windows 3.0	Utilities	Utilities	Check It, Hyperware Speed Kit, Microsoft Windows 3.0
MISCELLANEOUS					
Warranty	2 years	1 year	1 year	1 year	2 years parts, unlimited labor
First-year on-site service charge	\$225 (basic configuration), \$465 (tested configuration)	No charge	Depends on dealer	No charge	No charge
FCC Class B identification number	GQ81172	IR7ACMA486SXC	E7YBS486SX-20	EJH 4270E	I81486SX20

■—Yes □—No

N/A—Not applicable: The product does not have this feature.

ALR—Advanced Logic Research Inc., C&T—Chips and Technologies Inc., ERI—Empac Research Inc.

COMPUTERS

486SX/20s

AST Premium II 486SX/20	Austin 486/SX20 Winstation	Blackship 486SX/20U	C ³ Micro 486SX
\$6,334.00	\$3,290.00	\$3,095.00	\$3,495.00
210MB	212MB	200MB	213MB
Dealers	Dealers, direct	Direct	Dealers
ISA	ISA	ISA	ISA
Small-footprint	Small-footprint	Small-footprint	Mini-tower
AST AST ■/■ ■ AST Premium II 2.00 □ ■/□	Deico OPTi ■/■ □ AMI (May 1991) □ ■/■	Motherboard VLSI ■/■ ■ AMI DINT 6185 040990 □ ■/■	ERI Symphony ■/■ ■ AMI (May 1991) □ □/■
4MB-80MB None N/A	4MB-32MB OPTi 128K-256K	1MB-32MB Discrete logic 64K-256K	1MB-64MB Symphony Labs 64K-1MB
Three 5.25-inch, no 3.5-inch 2 Integrated 80MB-210MB 1.44MB	Three 5.25-inch, no 3.5-inch 1 Integrated 125MB-426MB 1.2MB or 1.44MB	Two 5.25-inch, two 3.5-inch None Integrated 40MB-350MB 1.2MB, 1.44MB	Five 5.25-inch, no 3.5-inch 1 Integrated 80MB-850MB 1.2MB, 1.44MB
1 (open) 2 (2 open) None 3 (2 open) 1, 2, 1	1 (open) 6 (5 open) None None 1, 2, 0	2 (open) 3 (open) None None 1, 2, 0	1 (open) 7 (5 open) None None None
800 x 600 Motherboard Western Digital	1,024 x 768 Card Tseng	1,024 x 768 Motherboard ATI	800 x 600 Card Tseng
145 5	200 5	200 4	250 5
5.0 ASTCache	5.0 Microsoft Windows 3.0	5.0 None	4.01 Microsoft Windows 3.0
1 year	1 year	1 year	1 year
Depends on third-party dealer	No charge	No charge	No charge
DJKASTP11486SX-20	HA7ACS420SX-U	1MX486SX20MLP	FIS-486I2533

CONTINUES

storage capacity. Second, ALR claims that its 200MB Western Digital hard disk performs DMA disk data transfer at three times the speed of conventional IDE hard disks. (Since the drive was not available at press time, PC Magazine Labs did not test this claim.)

ALR will give you a \$100 rebate if you turn in your 486SX when you upgrade. If you upgrade to a 486/50 and turn in a 486/25 or 486/33, the rebate is \$200.

The 486SX processor, ALR chip set, and coprocessor socket reside on a half-size card that plugs into the motherboard slot. The least-expensive upgrade you can

ALR designed the BusinessStation to require fewer slots by integrating hard and floppy disk controller functions onto the motherboard.

make is to add ALR's \$995 25-MHz SuperCharged 486DX chip (in reality, a standard Intel 25-MHz i486 CPU) to the 80487SX coprocessor socket. This knocks out the 486SX and turns your system into a 486DX/25. ALR claims to be one of the first companies that can use this slot for that purpose.

If you want to use a 486DX in conjunction with a Weitek coprocessor, you will have to insert a 486/25 processor module, which will cost \$1,695 (or \$1,595 after the \$100 rebate for the SX). A 486/33 upgrade module costs \$1,795.

Don't expect the unit to meet your needs for internal expansion beyond an additional floppy disk drive and a couple of internal boards. Two drive bays (one 5.25-inch and one 3.5-inch) are accessible from the front; another 1.44MB drive is mounted internally.

As evident by the BusinessStation's slimline case, ALR designed the system to require fewer slots by integrating the hard and floppy disk controller functions onto the motherboard. Video functions also are integrated by way of the motherboard's Western Digital Super VGA chip set. Three of the five motherboard slots

COMPUTERS

486SX/20s

486SX-BASED PCs: SUMMARY OF FEATURES

Products listed in alphabetical order by company name

	Dell PowerLine 420DE	Ergo Moby Brick 486SX-20	Everex Tempo 486SX/20	Hyundai Corporate Series 486SX/20	IBM PS/2 Model 90 XP
List price (standard configuration)	\$4,588.95	\$6,249.00	\$5,172.00	\$4,884.00	\$11,465.00
Standard hard disk capacity	200MB	202MB	210MB	200MB	160MB
Distribution channel	Dealers, direct	Direct	Dealers	Dealers	Dealers
Bus architecture	EISA	ISA	ISA	ISA	MCA
Case type	Small-footprint	Small-footprint	Small-footprint	Small-footprint	Desktop
MOTHERBOARD					
Motherboard manufacturer	Dell	Ergo Factory	Everex	Motherboard	IBM
Chip set manufacturer	Intel/Dell	VLSI	Everex/Siemens	VLSI/Northport	IBM
System shadowing/Video shadowing	□/■	■/■	■/■	■/■	■/■
Upgradable processor	■	■	□	■	■
BIOS version	Dell/Phoenix 1.00 A03	Ergo 2.0.7	AMI G304A	AMI 5.05	IBM (January 1991)
Flash EEPROM	■	□	□	□	□
Supports 80487/Weitek coprocessor	■/□	■/□	■/□	■/□	■/□
MEMORY AND PROCESSOR RAM CACHE					
Installable RAM	4MB-48MB	1MB-32MB	1MB-32MB	4MB-64MB	4MB-64MB
Cache controller	None	None	Everex	Proprietary	IBM
Installable RAM cache	N/A	N/A	64K-256K	64K-256K	256K-512K
DISK DRIVES					
Accessible drive bays:	Three 5.25-inch, no 3.5-inch	no 5.25-inch, one 3.5-inch	Three 5.25-inch, no 3.5-inch	Three 5.25-inch, no 3.5-inch	One 5.25-inch, one 3.5-inch
Internal drive bays	2	1	None	2	2
Disk controller location	Integrated	Integrated	Integrated	Integrated	Card
Hard disk options	80MB-650MB	44MB-510MB	20MB-1GB	100MB-300MB	80MB-400MB
Minimal floppy disk drive configuration	1.2MB, 1.44MB	1.44MB	1.2MB or 1.44MB	1.44MB	1.44MB
EXPANSION BUS					
8-bit slots	None	1 (none open)	2 (2 open)	None	None
16-bit slots	None	1 (open)	6 (3 open)	7 (6 open)	None
32-bit EISA/MCA slots	6 (open)	None	None	None	4 (3 open)
32-bit proprietary slots	1 (open)	None	None	None	1 (none open)
Parallel, serial, mouse ports on motherboard	1, 2, 1	1, 2, 0	None	1, 2, 0	1, 2, 1
VIDEO					
Display mode (tested configuration)	800 x 600	1,024 x 768	800 x 600	800 x 600	1,024 by 768 interlaced
Display circuitry location	Motherboard	Motherboard	Card	Card	Motherboard
Chip set manufacturer	Western Digital	C&T	Acumos	ATI	IBM
POWER SUPPLY					
Power supply (watts)	220	42	200	200	194
Number of device connectors	5	1	4	5	5
SOFTWARE					
DOS	5.0	5.0	5.0	5.0	4.01
Other bundled software	None	Microsoft Windows 3.0 with Adobe ATM or DESQview with Manifest	Exix, Microsoft Windows 3.0, OS/2	Microsoft Windows 3.0	IBM Cache
MISCELLANEOUS					
Warranty	1 year	1 year	1 year	18 months	1 year
First-year on-site service charge	No charge	No charge	\$80	\$189 (18 months)	Depends on dealer
FCC Class B identification number	E2K420DE	IPV1486SX-20E	E3EEX-5000 A-SX	IMX486SX20BP	AN08590A

■—Yes □—No

N/A—Not applicable: The product does not have this feature.

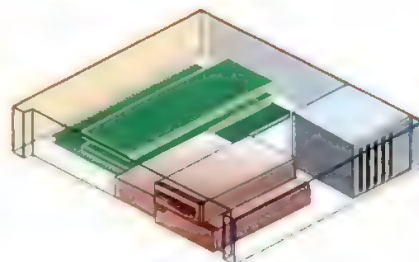
ALR—Advanced Logic Research Inc., C&T—Chips and Technologies Inc., ERI—Empac Research Inc.

COMPUTERS

486SX/20s



FACT FILE

**ALR BusinessStation 486ASX**

Advanced Logic Research Inc., 9401 Jeronimo, Irvine, CA 92718; 714-581-6770.

List price (tested configuration): \$4,788.

Memory and processor RAM cache: 9MB 80-ns. SIMMs.

Disk drives and controller: Maxtor 16-ms. 120MB IDE hard disk, 1.2MB and 1.44MB floppy disk drives.

Display: Western Digital 800-by-600 adapter with 256K RAM, ALR 14-inch monitor.

Monitor refresh rate: 72 Hz.

Software: DOS 5.0.

CIRCLE 411 ON READER SERVICE CARD

are proprietary: One holds the processor module; the second can hold either ALR's \$299 CachePack 64K processor RAM cache card or its \$795 256K cache card. The third slot takes a proprietary \$299 SCSI interface card that can daisy-chain up to seven SCSI devices. Once you insert a modem and another board into the two EISA slots mounted on the vertical tree extender, you're set. ALR claims that it will shortly have a network card and a fax modem card, either of which will fit into the proprietary SCSI adapter slot.

On PC Magazine Labs' processor and memory tests, the BusinessStation's performance was slightly below that of other machines in this roundup. Despite the motherboard-based Super VGA chip set, the BusinessStation's video score was one of the slowest in our test group.

ALR offers a one-year parts-and-labor warranty. All repairs and upgrades are handled through dealers, which operate as authorized service centers. ALR maintains a toll-free customer line from 7:00 to 5:00 P.S.T., Monday through Friday; this is not a support line; it directs owners to the closest authorized service center.

Although ALR is normally associated with high performance, in the case of the BusinessStation, ALR has produced a machine aimed more at the middle ground. When you consider its narrow expansion

Leading Technology PC Partner VX	Novas 486SX-20	Standard 486SX/20 Windows WorkStation	Swan 486SX	Zeos 486SX-20C
\$3,399.00	\$2,324.00	\$3,245.00	\$3,794.00	\$3,545.00
211MB	212MB	210MB	227MB	212MB
Dealers	Dealers	Direct	Direct	Direct
ISA	ISA	ISA	ISA	ISA
Desktop	Small-footprint	Small-footprint	Small-footprint	Tower

VTCL C&T/II	Novacor OPTi	Vega Symphony	Swan UMC	Zeos Intel/VLSI
□/□	■/■	■/■	■/■	■/■
□	□	□	□	■
AMI Mark III 386/486	Mr. BIOS 1.11	AMI (April 1991)	Award 486 BIOS	Award 3.10
□	□	□	□	□
■/□	■/■	■/■	■/■	□/□

1MB-12MB	4MB-32MB	1MB-64MB	1MB-64MB	1MB-32MB
None	OPTi	Symphony Labs	UMC	Intel
N/A	64K-256K	64K-256K	128K-256K	128K

Three 5.25-inch, no 3.5-inch	Three 5.25-inch, one 3.5-inch	Two 5.25-inch, one 3.5-inch	Three 5.25-inch, one 3.5-inch	Four 5.25-inch, one 3.5-inch
1	None	2	1	4
Integrated	Integrated	Integrated	Integrated	Integrated
106MB-426MB	40MB-676MB	40MB-1GB	50MB-660MB	42MB-1.1GB
1.2MB or 1.44MB	1.2MB, 1.44MB	1.2MB, 1.44MB	1.2MB, 1.44MB	1.44MB

1 (open)	1 (open)	None	2 (1 open)	1 (open)
6 (4 open)	7 (4 open)	8 (6 open)	5 (4 open)	7 (6 open)
None	None	None	None	None
1 (used)	None	None	1 (open)	None
None	None	1, 2, 0	None	1, 2, 0

800 x 600	1,024 x 768	1,024 x 768	1,024 x 768	1,024 x 768
-----------	-------------	-------------	-------------	-------------

Card	Card	Card	Card	Card
Tseng	Tseng	ATI	Tseng	Tseng

300	200	200	200	300
4	6	5	4	4

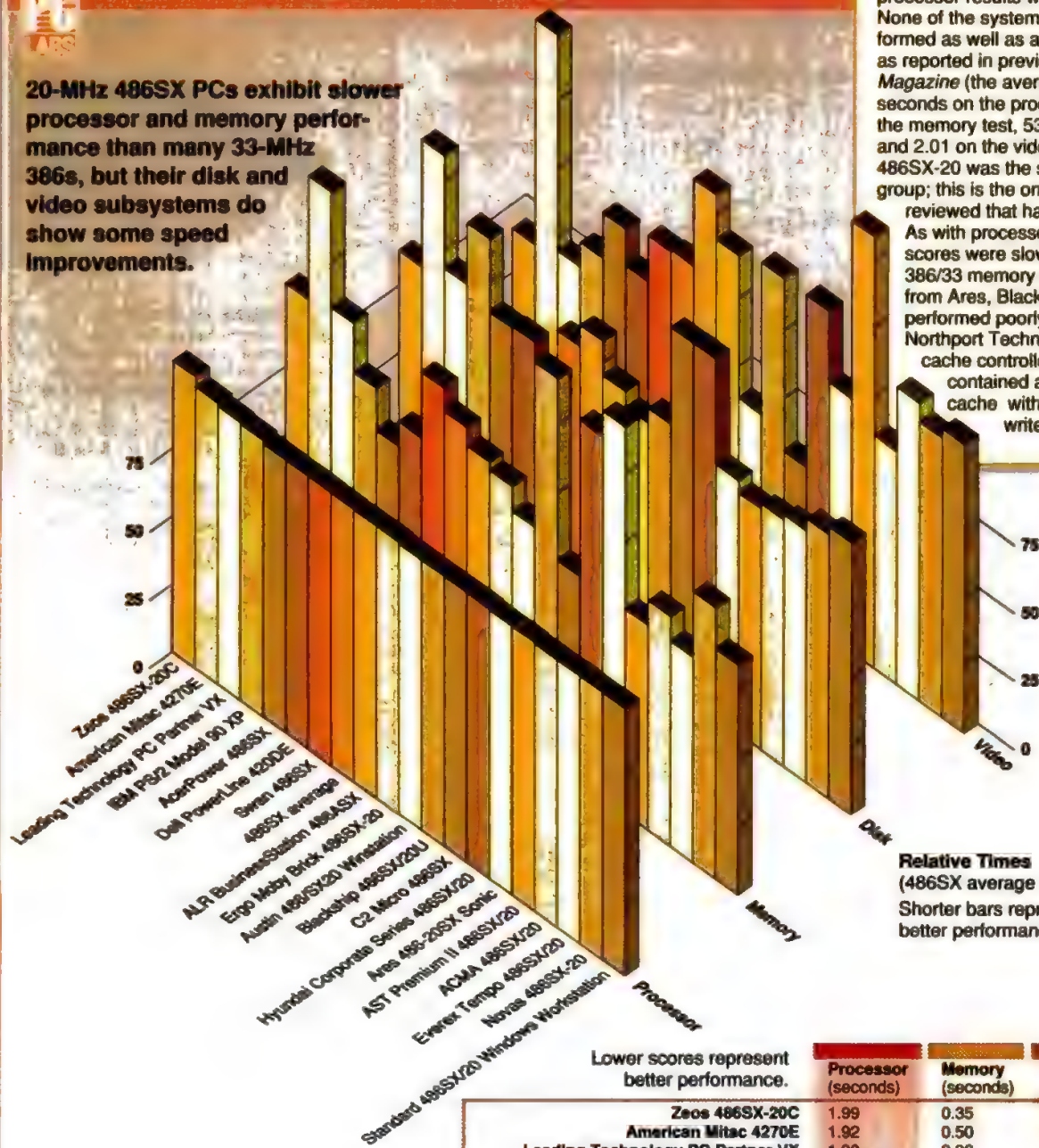
5.0	5.0	5.0	5.0	5.0
HyperDOS	None	HyperDisk, Microsoft Windows 3.0	Microsoft Windows 3.0	Ami Pro, Lotus 1-2-3 for Microsoft Windows 3.0, Microsoft Windows 3.0, WinRix

1 year	1 year	2 years	2 years	1 year (5 years keyboard)
No charge	\$100	No charge	No charge	\$49
IFS80-2506	ITJNOVACOR486	ID9486SX	HOYSWAN486SX20	BBYDPCT486SXT

ENDS

BENCHMARK TESTS: 20-MHz 486SX PCs

20-MHz 486SX PCs exhibit slower processor and memory performance than many 33-MHz 386s, but their disk and video subsystems do show some speed improvements.



Lower scores represent better performance.

	Processor (seconds)	Memory (seconds)	Disk (seconds)	Video (seconds)
Zeos 486SX-20C	1.99	0.35	40.53	1.10
American Mitac 4270E	1.92	0.50	62.00	2.47
Leading Technology PC Partner VX	1.90	0.36	43.05	1.16
IBM PS/2 Model 90 XP	1.89	0.30	53.43	1.31
AcerPower 486SX	1.87	0.25	41.12	1.59
Dell PowerLine 420DE	1.87	0.28	41.43	1.37
Swan 486SX	1.87	0.36	37.28	1.65
486SX average	1.86	0.33	46.16	1.66
ALR BusinessStation 486ASX	1.86	0.31	49.81	2.19
Ergo Moby Brick 486SX-20	1.86	0.30	43.93	1.92
Austin 486/SX20 Winstation	1.85	0.27	41.96	1.05
Blackship 486SX/20U	1.85	0.47	43.96	1.98
C2 Micro 486SX	1.85	0.25	60.45	0.93
Hyundai Corporate Series 486SX/20	1.85	0.44	60.52	1.98
Ares 486-20SX Sonic	1.84	0.47	42.76	1.54
AST Premium II 486SX/20	1.84	0.25	40.78	2.63
ACMA 486SX/20	1.83	0.28	41.60	1.42
Everex Tempo 486SX/20	1.83	0.25	42.47	1.81
Novas 486SX-20	1.83	0.33	44.57	1.70
Standard 486SX/20 Windows Workstation	1.83	0.28	45.98	1.76

WHAT THE NUMBERS MEAN

Among the 19 new 486SXs we tested, processor results were unremarkable. None of the systems' processors performed as well as average 33-MHz 386s, as reported in previous issues of *PC Magazine* (the average scores were 1.67 seconds on the processor test, 0.31 on the memory test, 53.84 on the disk test, and 2.01 on the video test). The Zeos 486SX-20 was the slowest in the current group; this is the only machine we reviewed that has an Award BIOS.

As with processor scores, memory test scores were slower than the average 386/33 memory score. The systems from Ares, Blackship, and Hyundai performed poorly, possibly due to Northport Technology's SC82C346 cache controller chip. These systems contained a 64K processor RAM cache with a direct-mapped write-back architecture.

COMPUTERS

486SX/20s

American Mitac's system, using a Phoenix/Intel BIOS chip set, was the slowest performer on the memory test.

In disk performance, four machines fared poorly: the American Mitac 4270E, the Hyundai Corporate Series 486SX/20, and the C² Micro 486SX (each with a Conner 3204 IDE hard disk) and the IBM PS/2 Model 90 XP (with a caching SCSI controller). The best disk performance came from the Swan 486SX's 12.3-millisecond Hewlett-Packard C2233 IDE drive.

The largest variance in test scores occurred on the video benchmark test—a trend we've seen in other processor groups. Video implementations based on the Tseng Laboratories chip set used in the C², Austin, and Zeos systems came out on top with the best scores. The below-average performance of the video subsystems that used the Western Digital Corp. (WDC) chip set was evident in the AST and American Mitac offerings. Dell, on the other hand, combined a WDC set with an enhanced Paradise BIOS, and its system scored somewhat better than average.

HOW WE TESTED

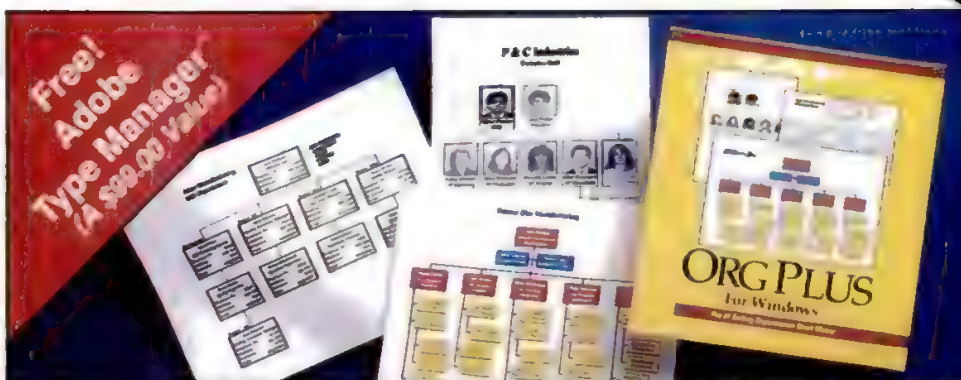
In testing these 19 486SX/20s, we used PC Magazine Labs' Hardware Performance Tests, Release 5.7, with the RAM cache and all shadowing enabled wherever possible. We used no software disk caches when performing disk benchmark tests, and no RAM-resident programs were loaded for any tests. The margin of error for the processor, memory, and video benchmark tests is 0.05 seconds.

■ The 80486 Instruction Mix benchmark test times a series of tasks specific to the 80486 chip. Since this test shows how the CPU operates in the context of the bus, processor, system memory, and motherboard architecture, faster times mean better overall computer performance.

■ The Conventional Memory benchmark test measures the read/write speed of the first 640K of memory. Slower times can indicate the presence of memory wait states or memory chips rated at slower access speeds.

■ The disk score is the sum of the small-record and large-record DOS File Access benchmark test times. Each test times disk throughput as a result of mechanical disk drive speed, hard disk controller function, and bus speed. No software cache is employed.

■ The Direct to Screen benchmark test indicates the speed of the video adapter memory. A good score indicates that information can get to the screen quickly, particularly for programs that avoid the computer's BIOS and go directly to the screen.



Org Plus For Windows makes organization charts 3 - 4 times faster than its competitors!

The Quick, Professional Way to Show Who's Boss

Banner Blue brings you a new Windows® version of its #1 selling org chart maker—Org Plus® For Windows! Now you can get fast, professional-looking organization charts combined with the easy-to-use, graphical features of Microsoft® Windows.

Fast and Fully Automatic

Org Plus automatically draws the boxes and lays out the connecting lines. Type information directly into each box—Org Plus automatically expands or shrinks boxes to fit perfectly. Move a department or give it a different chart style—Org Plus reformats your entire chart, instantly!

Built for Windows from the Ground Up

Click icons to create boxes and change chart styles. Make selections from pull-down menus and dialog boxes. Display and print your chart in vibrant colors. You can even scan pictures of your employees into the boxes of your chart!

What You See is What You Get

You always see on the screen what your chart looks like when printed. Need to delete a box? Select it and press the Delete key—the box disappears from the screen! Need to change a font? Select the text and choose a font from a pull-down menu—Org Plus re-displays your text instantly!

Our Most Powerful Formatter Ever

Show special relationships such as subgroups, co-managers, dotted-line connections, different types of staff positions, and multiple topmost boxes. Give text any size, color, or font!

Add your company logo, or type annotations anywhere in your chart. A complete set of drawing tools lets you get any special effect you can't get automatically.

Compact Charts

Use the powerful Make Fit command to apply a number of space-saving changes automatically. Use any of the FREE, ultra small, proportional fonts included in Org Plus to squeeze even more information onto a single page.

Works with All Versions of Org Plus

Org Plus is the only org chart solution that has DOS, Windows, and Macintosh versions available. Now everyone in your company can use the #1 selling org chart program.

\$199.99 Yes, I want to order Org Plus For Windows for only \$199.99. Add \$4.00 shipping charge, and in California add 7.25% sales tax. 30-day, money-back guarantee. To order by Visa, Mastercard, or American Express:

Call 510-794-6850

Banner Blue
SOFTWARE

P.O. Box 7865,
Fremont, CA 94537

PC1231

Org Plus is a registered trademark of Banner Blue Software Incorporated. Windows is a trademark and Microsoft is a registered trademark of Microsoft Corporation. Adobe Type Manager is a trademark of Adobe Systems Incorporated. © Copyright 1991 Banner Blue Software Incorporated. All rights reserved.

CIRCLE 351 ON READER SERVICE CARD

PROTECT YOUR COPIES OF PC MAGAZINE

Make your collection of PC Magazine a handsome addition to your office or home—and protect and organize your copies for easy reference!

PC Magazine Binders and Cases are made of durable, luxury-look leatherette over quality binder board. Custom designed for PC Magazine, every order receives FREE transfer foil to mark dates and volume numbers.

FOR FAST SERVICE CALL TOLL-FREE 1-800-825-6690

MAGAZINE BINDERS

Hold your issues on individual snap-on rods. \$9.95 each; 3 for \$27.95; 6 for \$52.95.

OPEN BACK CASES

Store your copies for individual reference. \$29.95 each; 3 for \$21.95; 6 for \$39.95.



PC MAGAZINE

Please send ☐ Binders ☐ Cases Quantity _____

Payment enclosed \$_____. * Add \$1 per case/binder for postage & handling. (Outside USA, add \$2.50 per case/binder ordered, US currency only.)

Charge my:

☐ Amex ☐ Visa ☐ MC (Minimum order \$15)

Card No. _____ Exp. Date _____

Mr./Mrs./Ms. _____
Please Print Full Name

Address _____
No P.O. Numbers Please

City _____

State _____ Zip _____

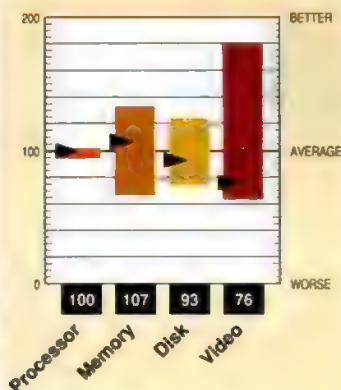
* PA residents add 6% sales tax.

ALR BusinessStation 486ASX

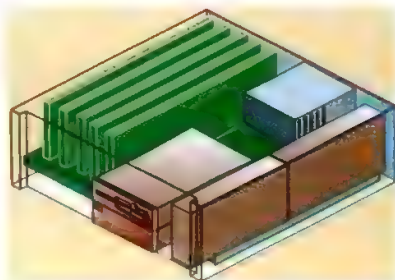


In Short: You have to like the ALR name to buy the ALR BusinessStation 486ASX, with its higher-than-average price, limited expansion capacity, and slow video score. Nevertheless, this cleanly designed slimline EISA-based upgradable has a built-in mouse port, Super VGA on the motherboard, and an optional 200MB IDE hard disk.

▶ TEST RESULTS



FACT FILE



Mitac 4270E

American Mitac Corp., 410 E. Plumeria Dr., San Jose, CA 95134; 800-648-2287.

List price (tested configuration): \$4,470.

Memory and processor RAM cache: 8MB 80-ns. SIMMs, 64K cache.

Disk drives and controller: Conner 18-mb, 200MB IDE hard disk, 1.2MB floppy disk drive.

Display: American Mitac Super VGA adapter with 512K RAM, American Mitac 14-inch monitor.

Monitor refresh rate: 56 Hz.

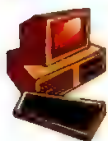
Software: DOS 4.01, MCache.

capacity, higher-than-average price, and slower-than-average video score, you may want to look elsewhere.

AMERICAN MITAC CORP.

Mitac 4270E

by Joseph Desposito



The main attraction of American Mitac's 4270E is its EISA bus. Apart from this, the unit's poor performance on PC Magazine Labs tests and its small design quirks make this machine hard to recommend.

Priced at \$4,470 for our standard configuration, the Mitac includes 8MB of RAM, a 64K external SRAM cache, a 200MB Conner hard disk, 1.44MB and 1.2MB floppy disk drives, a Mitac Multifunction card (which handles both video and I/O functions), a low-radiation Mitac L1420 Super VGA monitor, and DOS 5.0. The low-radiation, 0.28-mm.-dot-pitch monitor added \$100 to this price, compared with Mitac's standard monitor.

RAM is expandable to 64MB, all of it located on an add-in board in a proprietary 32-bit slot. In other words, there is no memory on the motherboard.

Most of the I/O ports are on the Mitac Multifunction board, except for the mouse port, which originates on the motherboard.

Both mouse and keyboard connectors are mini-DINs, which is standard for the mouse but not the keyboard. This could be an annoyance if you ever decide to replace the keyboard.

The Mitac's small-footprint case contains four drive bays. Two standard-height and one 3.5-inch are accessible from the front; another 3.5-inch drive is internal.

The Mitac's case design and the location of the motherboard make adding

components difficult. For example, since the motherboard covers almost the entire base of the case, it is hard to reach the SRAM and coprocessor sockets that are located underneath the drive bays. To increase the amount of SRAM in the system, you have to remove the mother-

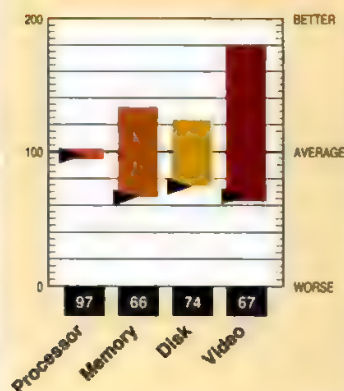
CIRCLE 412 ON READER SERVICE CARD

American Mitac 4270E



In Short: Poor performance and design quirks make the Mitac 4270E difficult to recommend. Adding components can be a struggle, and the system's proprietary I/O-and-video Mitac multifunction card registered a poor video test result. The saving grace for this system is its EISA bus, though the unit we tested contained no EISA components.

▶ TEST RESULTS



Three great reasons to buy dBASE now:

- ✓ **1. Borland's commitment to dBASE**
- ✓ **2. Borland's commitment to technology**
- ✓ **3. Borland's commitment to customers**

Now that it's from Borland, you can buy dBASE® with total confidence. Simply stated, Borland is fully committed to delivering more power, more flexibility and better support to the whole dBASE community.

Borland advances the dBASE standard.

Because Borland is the leader in object-oriented technology, today's dBASE buyer will get more features and new dBASE releases in less time – such as SQL server links, event handling, object-oriented extensions to the dBASE language and compilers that generate fast, tight code.

In addition, dBASE users will be able to effortlessly integrate data from



the desktop to the mainframe with our InterBase server.

Borland support means greater customer satisfaction.

Now that dBASE is from Borland, dBASE customers are assured of

world class support. In fact, J.D. Power and Associates ranks Borland "Best Application Software in Customer Satisfaction, in small to medium-size and large businesses."

Borland, your database partner in the 90's.

When it comes to technological innovation and customer satisfaction,

Borland leads the way. Borland is committed to advancing the dBASE standard on multiple platforms – DOS, Windows, VAX VMS, Sun, UNIX and Macintosh.

A special offer when you buy dBASE now.

Buy dBASE from any dealer between November 1, 1991 and January 31, 1992, and get a \$100 manufacturers rebate. (See the coupon accompanying this ad for details.)



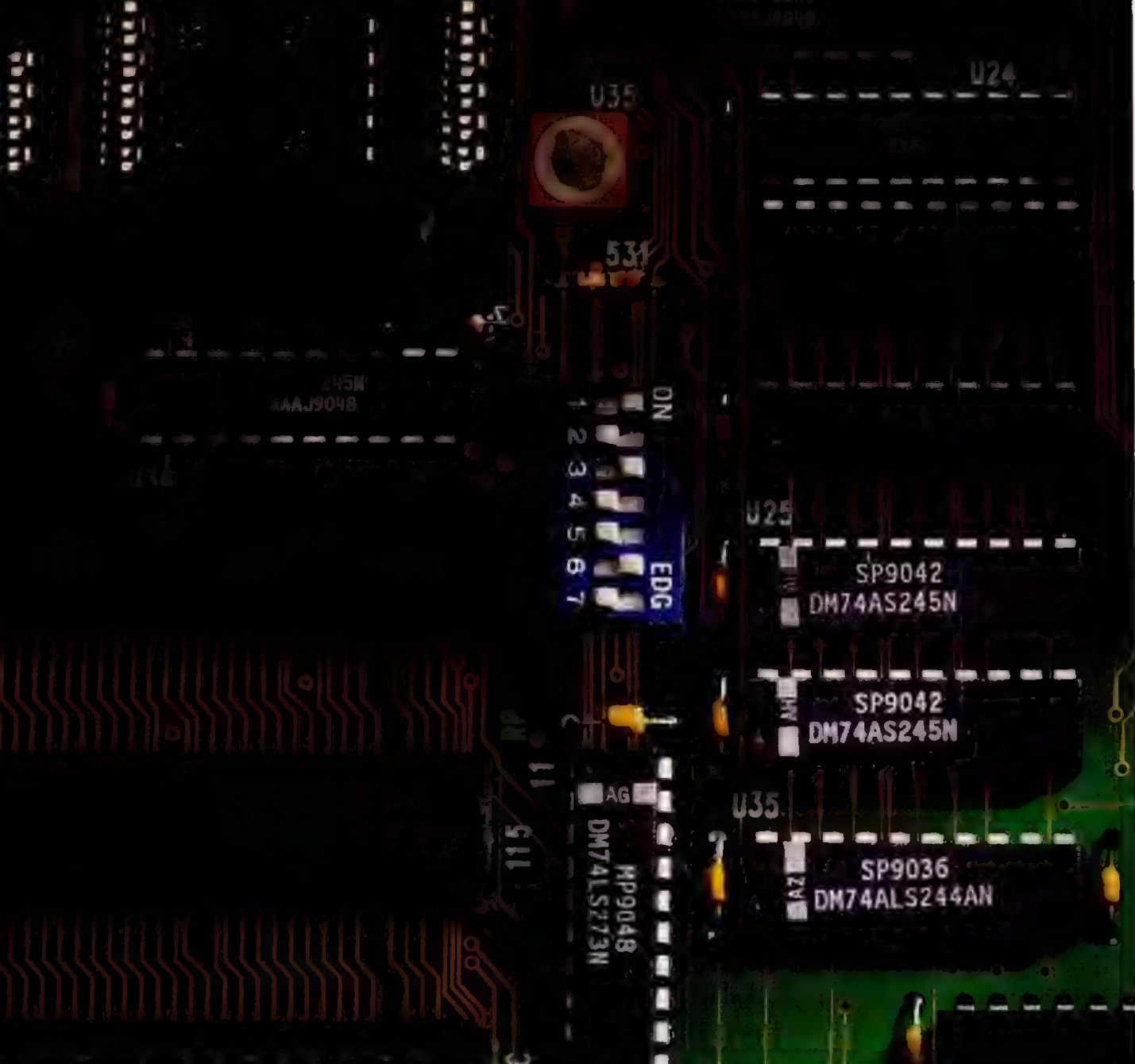
See your dealer today or call 1-800-568-9092 now for rebate information.

B O R L A N D

Software Craftsmanship

CODE MP16

©1991 Borland International, Inc. All rights reserved. Borland, dBASE and the names of other Borland products are registered trademarks or trademarks of Borland International. Some of the product names used herein have been used as identification only and may be trademarks of their respective companies. 1991 J.D. Power and Associates® Computer End User Satisfaction Study: Phase I: Office Based Small to Medium Sized Businesses. Response from Business End Users at 1,784 business sites. Small to medium sized businesses were based on office sites with between 1 and 499 employees. 1991 J.D. Power and Associates® Computer End User Satisfaction Study: Phase III: Office Based Large Businesses. Responses from Business End Users at 1,094 business sites. Large businesses were based on office sites with 500 or more employees. J.D. Power and Associates is a service mark of J.D. Power and Associates. BI 1447



Ask for genuine Intel or who knows what yo



Intel microprocessor — an Intel Math CoProcessor

If you need a math coprocessor to speed your power applications, ask yourself this question: Which would you rather have sitting next to your

or something you may know nothing about? Because if you don't specify Intel, that's basically what you're getting — a big question mark. With Intel, however, there's simply no question. You're getting quality.

That's because Intel has the longest track record with math coprocessors. In fact, we've manufactured



Math CoProcessors, u'll have to count on.

and sold millions more than all the others combined. And we've tested every one of them with the most exhaustive battery of tests in the industry. All to assure you absolute reliability.

So ask for Intel Math CoProcessors. Or there's no calculating what you'll end up with.

For a free information packet, including our new low prices, call (800)538-3373.

intel.

The Computer Inside.™

CIRCLE 512 ON READER SERVICE CARD

The Mitac 4270E we tested did not come with any add-in boards that could take advantage of the machine's five EISA slots.

board first.

Another example of the non-user-friendly design is the hard disk. Removing the hard disk from its bracket alongside the power supply is not difficult, but before you do that you must remove a metal bracket that holds a 1.44MB floppy disk drive. Even adding a coprocessor involves extra steps: You first must remove the floppy disk drives and then remove a plate at the base of the bay.

The Mitac's complement of six slots consists of five EISA slots and one proprietary 32-bit slot. Software to configure EISA boards is included. Unfortunately, the model we tested did not come with any add-in boards that could take advantage of the bus.

The Mitac made a poor showing on all our benchmark tests; it turned in the next-to-slowest scores on our processor and video tests and the slowest score on our memory test. Its score on our disk test was the slowest in our group.

The Conner 3204 IDE hard disk performed poorly in the Mitac 4270E and in other units reviewed here. The Western Digital video chip set on the Mitac Multifunction card has also consistently shown poor performance on PC Labs' tests. In addition, the Phoenix BIOS and Intel chip set combination turned in slow times on the memory test.

American Mitac offers a one-year warranty on parts and labor and one year of free on-site service through Bell Systems, which has about 1,000 locations nationwide. Extending this service costs \$100 per year. Free technical support is available through a toll-free number.

American Mitac positions the Mitac 4270E as its entry-level EISA system. If the EISA bus is a high priority for you, the Mitac 4270E is worth a look. But poor performance and minor design flaws are reason enough to pass it up.

COMPUTERS

486SX/20s

ARES MICRODEVELOPMENT INC.

Ares 486-20SX Sonic

by Patrick Honan



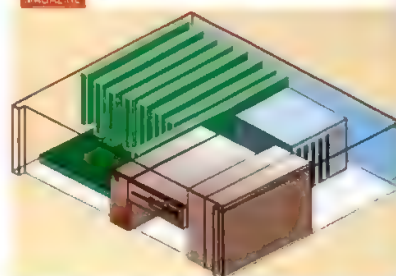
Ares Microdevelopment started as a local dealer about eight years ago and entered the mail-order market around two years ago. The company strives for superior quality control and attributes its appeal to extensive support, which is available 24 hours a day.

The \$3,450 Ares 486-20SX Sonic we received for testing matched our standard configuration: 8MB of RAM, a 210MB hard disk, 1.44MB and 1.2MB floppy disk drives, and a 1,024-by-768-resolution color display subsystem. It also included DOS 5.0 and *Microsoft Windows* 3.0, which Ares bundles with every system. The system's 14-inch monitor, a non-interlaced Panasonic ViewSonic 5 Plus, had a 72-Hz refresh rate and a crisp 0.25-mm. dot pitch. A 486/25 from Ares in this configuration costs \$300 more than the 486SX/20; the 486/33, \$350 more. Mini- and full-tower cases add \$50 and \$60 to the desktop price. Desktop systems based on AMD's 386/33 cost \$175 less; those based on AMD's 386/40, \$150 less.

The Sonic's Technology Power motherboard has two sockets: 486SX/20 and Intel's upgrade socket. But Technology Power has modified the upgrade



FACT FILE



Ares 486-20SX Sonic

Ares Microdevelopment Inc., 23660 Research Dr., Unit A, Farmington Hills, MI 48335; 800-322-3200, 313-473-0808.

List price (tested configuration): \$3,450.

Memory and processor RAM cache: 8MB

70-ns. SIMMs, 64K cache.

Disk drives and controller: Quantum 15-ms. 210MB IDE hard disk, 1.2MB and 1.44MB floppy disk drives.

Display: Diamond 1,024-by-768 adapter with 1MB RAM, ViewSonic 14-inch monitor.

Monitor refresh rate: 72 Hz.

Software: *CheckIt*, DOS 5.0, *HyperWare* Speed Kit, *Microsoft Windows* 3.0.

CIRCLE 413 ON READER SERVICE CARD

socket so that it will accept either Intel's 80487SX coprocessor or a 25- or 33-MHz 486DX. Ares sells the 486DX/33 and a chip puller for \$400—slightly less than Intel's \$428 unit price. You'll need to throw a switch or two, and the system will run slightly faster without the 486SX installed, Ares says.

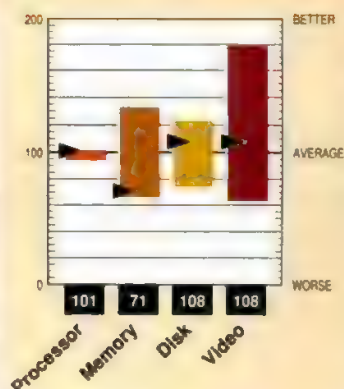
The Sonic uses 70-nanosecond SIMMs

Ares 486-20SX Sonic



In Short: The \$3,450 Ares 486-20SX Sonic is affordably priced and does not skimp on features. Six bays for storage devices and six open slots in the tested machine leave plenty of room for expansion. The Sonic did stumble on the memory test, due to a Northport Technology cache controller chip and a 64K RAM cache. However, it placed second on the processor test and in the middle of the pack on the other benchmark tests.

TEST RESULTS





Another state-of-the-art Laser Beam Printer from the people who perfected the art.

Canon takes Laser Beam Printing another step further with the new Canon LBP®-4 PLUS. This amazing printer offers superb Automatic Image Refinement, and gives you the option of genuine Adobe® PostScript®.

But then, Canon has always been at the forefront of Laser Beam Printing technology.

Our replaceable cartridge helped make Laser Beam Printers compact and virtually maintenance-free. Built-in scalable fonts offered greater flexibility.

And now, Automatic Image Refinement in the new LBP-4 PLUS and LBP®-8 Mark III PLUS automatically smooths out jagged edges and curves to perfect all your printouts—from text to graphics. And Adobe PostScript lets you print all your PostScript files.

Call 1 (800) 848-4123 for information on our complete line of Laser Beam Printers. And let the people who perfected the art improve *your* image.



LBP®-4 PLUS

LBP®-8 Mark III PLUS

LBP®-8 Mark III T™

LBP®-8 Mark III R™

Canon
LASER BEAM PRINTERS

Working To Improve Your Image.™



Adobe® PostScript® and the PostScript logo are registered trademarks of Adobe Systems Inc. in the U.S.A.
Canon® and LBP® are registered trademarks and Mark III T and Mark III R are trademarks of Canon Inc.
© 1991 Canon U.S.A. Inc. CIRCLE 187 ON READER SERVICE CARD

for system RAM and 15-ns. SRAM for its direct-mapped 64K RAM cache. You can install up to 32MB of RAM on the motherboard using 4MB SIMMs and an additional 32MB via a memory expansion board.

The Sonic's desktop-size case houses six drive bays: four 5.25-inch and two 3.5-inch. Two of the 5.25-inch and both the 3.5-inch bays are accessible from the front. Seven 16-bit ISA slots allow conventional expansion; an eighth slot accepts either a proprietary 32-bit memory board or an 8-bit board.

The Sonic tied as second-fastest on our processor test, just 0.01 seconds behind

**The AST Premium II's
strong points are
easy upgradability
and a high level
of system
integration.**

the fastest. But on the memory test it tied with the Blackship for second-slowest—the result of a timing problem, traced to a Northport chip on the motherboard, that occurs when the memory test is run with a 64K cache. Blackship and Hyundai, the two other systems that used the Northport chip and a 64K cache, also performed poorly on this test.

On the disk test, the uncached score for the Sonic's 15-millisecond Quantum 210MB IDE hard disk was faster than average for the test group. But both the disk score under caching with the Sonic's proprietary software and the resulting 20 percent reduction in time were about average for the group. The Sonic also tested slightly faster than average on our video test.

Ares backs the Sonic with a two-year coverage on parts and a lifetime coverage on labor. The warranty on the monitor ranges from one to three years, depending on the manufacturer, and the Diamond Video card is covered for five years. Ares offers a 60-day money-back guarantee and free on-site service from TRW during the first year. Toll-free technical support is available 24 hours a day, seven days a week.

AST RESEARCH INC.

AST Premium II 486SX/20

by Bruce Brown



There's no question that AST Research builds and sells sturdy computers. These computers are less expensive than Compaq and IBM units, but they are not cheap, even if in some cases dealer discounts range as high as 30 percent. And a look at the pricing structure of AST's Premium II line suggests that paying more does not necessarily buy you more.

In our standard configuration of 8MB of RAM, a 210MB hard disk, 1.2MB and 1.44MB floppy disk drives, a Super VGA color display subsystem, and DOS 5.0, the AST Premium II 486SX/20 costs \$5,735; take 30 percent off the list price and you can expect to pay about \$4,000 on the street.

A better bet appears to be a 386/33 with a math coprocessor: Such a system performed faster than the 486SX/20 on our processor test and costs about \$200 less. If you want to upgrade to a 486/33, you'll need to buy a processor card that lists for \$2,595, but if you start at the 486/33 level, you'll save nearly \$500. (An identically configured 486/33 lists for \$7,834.)

The monitor we received with the tested system was a 14-inch Super VGA with a 70-Hz refresh rate at a maximum 1,200-by-768 resolution. The hard disk was a 210MB Western Digital Piranha IDE drive rated at less than 16 milliseconds.

RAM in the Premium II is installed on one or more replaceable cards. Four slots on the processor card accommodate up to 16MB RAM in 4MB 70-nanosecond SIMMs. Two optional memory cards, each destined for a 32-bit slot, have the ability to address an additional 32MB, which can bring the total system RAM to 80MB.

The Premium II's strong points are easy upgradability and a high level of motherboard integration. To upgrade, just loosen three thumb screws, open the case, remove one Phillips-head screw, and switch cards. The highly integrated motherboard holds AST's video subsystem, disk drive interfaces, I/O ports, and mouse port, freeing slots that once held interface cards for these functions. Expansion possibilities are determined by

the Premium II's six slots: one 8-bit, two 16-bit, and three others that can function as either 16-bit ISA or 32-bit proprietary.

Under 32-bit operation, these slots can accept either an optional memory module or one of AST's proprietary 32-bit CUPID (Completely Universal Processor I/O Design) cards. In the model tested, one of these 32-bit slots was filled by a module that held the processor, a slot for the math coprocessor, and system memory. When applicable, CUPID modules also hold RAM cache (the 486SX/20 processor module does not have an external RAM cache).

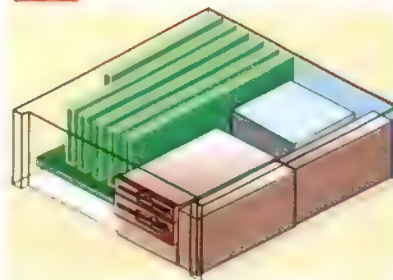
The Premium II's small-footprint case has five drive bays: Three (two half-heights and a third-height) are accessible from the front; two 3.5-inch drives are internal.

On our benchmark tests, the Premium II was one of the best performers. It tied with the Ares 486-20SX Sonic for second-fastest on our processor test and came in first on our memory test, tied with three other machines. The disk score was also faster than average, but the Premium II showed its characteristic weakness on the video test and straggled in last.

Service for AST systems is handled at authorized service centers. The service provider is IntelLogic Trace, a Texas Instruments company with over 1,200 lo-



FACT FILE



AST Premium II 486SX/20

AST Research Inc., 16215 Alton Pkwy., Irvine, CA 92718; 800-876-4278, 714-727-4141.

List price (tested configuration): \$6,334.

Memory and processor RAM cache: 8MB 70-ns. SIMMs.

Disk drives and controller: Western Digital sub-16-ms. 210MB IDE hard disk, 1.2MB and 1.44MB floppy disk drives.

Display: Western Digital Super VGA adapter with 512K RAM, AST 14-inch monitor.

Monitor refresh rate: 56 Hz.

Software: ASTCache, DOS 5.0.

CIRCLE 414 ON READER SERVICE CARD

EAR-O-DYNAMICS™



What the Future Sounds Like

STEREO • F/X™ and VGASTEREO • F/X™

Prepare yourself to be transported into a new universe of stereo sound. ATI STEREO • F/X and VGASTEREO • F/X multimedia sound adapters offer mind-blowing stereo acoustics that add a whole new dimension to "serious" DOS* and Windows* applications — and propel PC games beyond the bounds of imagination.

Cosmic 'Coustics

Forget the tinny, raspy, mono sound of older-generation sound cards. Our advanced sound filtering and 44 kHz sampling rate produce cosmic CD-quality sound. And our stereo enhancement circuitry opens up the vastness of stereo space — even for existing mono applications.

Stellar Stereo

STEREO • F/X and VGASTEREO • F/X include all the stellar sonic power you'll need: 11 voice FM



synthesizer; digital sampled sound capability; a powerful 8 watt amplifier; stereo input and output jacks; MIDI interfacing; total software support, AdLib* and Sound Blaster* compatibility; and even a dual-speed with today's faster-than-light PCs.

Galactic Graphics

The VGASTEREO • F/X also includes full VGAWONDER XL* capability — with 32,768 colors, high-resolution 1024x768 graphics, and a Microsoft*-compatible mouse.

ATI multimedia stereo adapters. Don't get stuck in the past; the future of PC sound awaits you...

**ATI Multimedia Series,
from \$199***

**FREE
STEREO SPEAKERS†**

ATI TECHNOLOGIES INC.

3761 Victoria Park Avenue
Scarborough, Ontario
Canada M1W 3S2

Telephone: (416) 756-0718
User Support: (416) 756-0711
Facsimile: (416) 756-0720

Perfecting the PC

Copyright © 1991 ATI Technologies Inc. † Packaged separately and available at time of purchase. Limited time offer.
* Trademarks are registered by their respective companies. Features and specifications are subject to change without notice. **Dealers may sell for less.

We LOVE!

CORELDRAW!

77%

of Survey Publish Magazine Readers Prefer CorelDRAW

A Hefty Slice!

4%

ARTS & LETTERS

7%

With success after success, CorelDRAW continues its sweep across the industry, winning over 40 international awards. Now yet another award is added to the list: Publish Magazine's "Reader's Choice Award '91" for PC drawing and PC clipart, beating Micrografx and Arts and Letters ten to one! Join the CorelDRAW winning team today. Everyone loves it!

MOST VERSATILE

Dress up any document. Watch your project go from the ordinary to the spectacular using CorelDRAW's unique special effects.

EASIEST-TO-USE

Just point and click. CorelDRAW's interface was designed to do all the work. It's fast and it's fun! No wonder it's the world's #1 seller.

MOST FONTS

Over 150 on-screen typefaces that can be altered in any way. Skew, rotate, extrude, stretch, etc. No body type comes close!

BEST CLIPART

Choose from over 4,000 images and symbols. Use them as they are or as a short cut to your own designs. Voted best clipart by Publish readers!

CIRCLE 729 ON READER SERVICE CARD



COREL
TEL: (716) 423-8200
FAX: (613) 728-9790

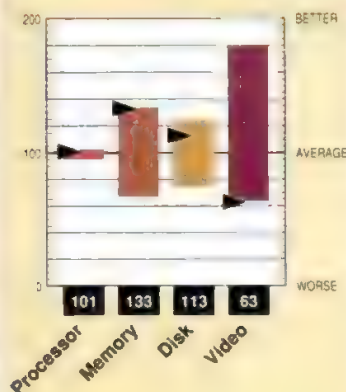
Enter now and win monthly in the CorelDRAW \$1,000,000 World Design Contest!

AST Premium II 486SX/20



In Short: The AST Premium II 486SX/20 is well designed, with a sturdy construction and easy processor module upgrades. This small-footprint machine's 80MB RAM expansion room is impressive but less significant than its room for five storage devices and its five open expansion slots. With a costly price tag (\$6,334 for the tested configuration, including a 80487SX math coprocessor), the Premium II is sold by dealers and can be found at a discount.

TEST RESULTS



cations nationwide. AST's standard warranty covers parts and labor for one year. Extended service contracts for one or two additional years are available for \$300 per year.

The AST Premium II 486SX/20 offers easy upgrading via processor modules and a potential 80MB of RAM, though if you're on the point of choosing this system, you're better off selecting a 386DX/33 or 486DX version. Good discounts can bring the price into line, but on-site service would make the deal even sweeter.

IDE hard disk, 1.2MB and 1.44MB floppy disk drives, a 1,024-by-768-resolution color display subsystem with a 15-inch, noninterlaced, multiscanning monitor, and DOS 5.0, meeting the standard configuration we required for these reviews. That price also includes *Microsoft Windows* 3.0 and a Microsoft serial mouse. Austin sells a basic Winstation system with 4MB of RAM, 128K of RAM cache (expandable to 256K), a 125MB hard disk, one

floppy disk drive, a 256K VGA adapter (upgradable to 1MB), a monochrome monitor, DOS 5.0, *Microsoft Windows* 3.0, and a mouse for \$2,490.

The machine's biggest competition, though, may come from its own family. As with all 486SX/20s tested here, a 386/33 in the same configuration runs faster—at least with 16-bit software. At \$2,890, Austin's 386/33 costs \$400 less than the 486SX/20. A slim \$150 over the price of the \$3,290 486SX/20 moves you up to Austin's \$3,440 ISA-bus 486/33i, and the 486/33E is \$4,957.

SMALL ENHANCEMENTS

You can pay more for a machine and not get some of the small enhancements that the 486/SX20 gives you. These include jumpers that allow you to set the serial ports as COM1 through COM4 and make the parallel connection LPT1 or LPT2 at IRQ7 or IRQ9. CMOS power comes from a trickle-charged nickel cadmium battery, but if that should ever die, change another jumper and you can substitute a battery pack rather than unsolder the original.

The small-footprint case allows room for expansion via four drive bays: three front-accessible half-heights and an internal 3.5-inch drive. On our tested units, six of the motherboard's seven slots (six 16-bit and one 8-bit) remained free; a video card occupied the seventh.

Memory chips plug directly into the motherboard, which can hold 32MB of RAM in 70-nanosecond 4MB SIMMs.

AUSTIN COMPUTER SYSTEMS

Austin 486/SX20

Winstation

by Gary Berline



With the Austin 486/SX20 Winstation, Austin Computer Systems adds another low-cost, solid performer to this aggressive company's line. Small enhancements boost the machine's flexibility, and a top-notch service policy makes it look like a safe bet. Like many of its competitors, though, this machine may never escape from the shadow of its 486DX siblings.

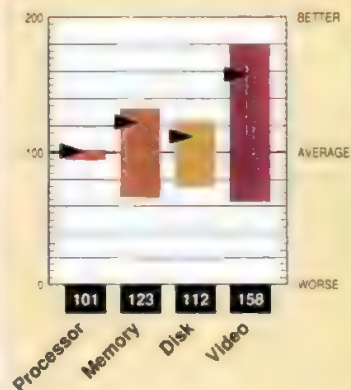
Our \$3,290 test unit came with 8MB of RAM, a 256K processor RAM cache, a 210MB Western Digital Piranha 4200

Austin 486/SX20 Winstation



In Short: The Austin 486/SX20 Winstation extends Austin Computer Systems' line of low-cost machines, which exhibit the flexibility and performance of much pricier units. On its own or against competing entries, the \$3,290 package we tested is a good buy. But viewed in the light of the \$450 you will save by not buying a faster 386/33, or the paltry \$150 extra it takes to buy Austin's 486/33 slugger, this bargain's value fades away.

TEST RESULTS



Compudyne Notebooks

386SL/20 Notebook^{††}
VGA Mono, 60 MB
\$2199

- ▼ Intel® 80386SL 20 MHz processor
- ▼ 64 K CPU cache
- ▼ 2 MB RAM (Max to 8 MB)
- ▼ 60 MB, 19 ms hard drive
- ▼ Optional 80387SX coprocessor
- ▼ 1.44 MB, 3 1/2" internal floppy drive
- ▼ 10" 64-grey scale LCD VGA display
- ▼ 1 parallel, 2 serial ports
- ▼ External monitor and keyboard ports
- ▼ 6.4 lbs., 8.5" x 11" x 1.9"
- ▼ MS-DOS 5.0 and file transfer utilities

Intel 386SL Power!

At last - a CPU chipset specially designed for notebooks!

30% more speed! 20 MHz operation! 64 K CPU cache!

It combines the power of a 20 MHz 80386SL processor with a 64 K CPU cache, which gives you up to 30% more processing speed than conventional 386SX 20 MHz notebooks while reducing power consumption up to 70%.

300% more battery life!

Most SX notebooks offer a maximum 3-hour battery life with a useful working time of only 1 to 2 hours. Now, with the new Intel 386SL chips, battery life is extended to over 9 hours with a continuous working time of over 3 hours! Plenty of time to get some real work done.

Incredibly smart power management!

Older notebooks offer energy savers such as Disk Shutdown, Screen Blanking and Suspend/Resume modes. The SL goes much further by adding the ability to slow down the CPU to 0 MHz, and shut down power to I/O ports and other devices while you're reading the screen, composing or even between keystrokes!

Never lose your work!

Our SL notebook has the ability to detect when the battery is low and "saves everything" in RAM memory until you get a chance to plug in and recharge! Your work is restored exactly where you left off.

Brilliant 10" 64-grey scale VGA LCD screen!

We dare you to compare it to any current model on the market. Its brilliance, the depth of its color mapping and full 10" size make working with our SL Notebook a pleasure.

Full size, full travel, tactile keyboard!

A rarity in notebooks! Full travel operation, tactile feed-back, and full size keycaps!

All the usuals, too!

We don't leave out all the regular features, either! They're standard with every Compudyne notebook!



Compare our prices to CompuAdd, ZEOS and others. We will always be lower...Guaranteed!

at unbelievable prices!

Compudyne gives you more than just lip service!

- ▼ Overnight replacement service
- ▼ Toll-free technical support hotline
- ▼ One-year warranty
- ▼ 30 day "no-questions-asked" return policy
- ▼ Custom configurations
- ▼ Corporate credit terms
- ▼ Volume purchase agreements

386SX/16 Notebook^{††}
VGA Mono, 40 MB
\$1499

- ▼ Intel 80386SX 16 MHz processor
- ▼ 2 MB RAM (Max to 16 MB)
- ▼ 40 MB, 19 ms hard drive
- ▼ Optional 80387SX coprocessor
- ▼ 1.44 MB, 3 1/2" internal floppy drive
- ▼ 9" 32-grey scale LCD VGA display
- ▼ 1 parallel, 2 serial ports
- ▼ External monitor and keyboard ports
- ▼ 6.5 lbs., 8.5" x 11" x 2.5"
- ▼ 3-hour battery pack
- ▼ MS-DOS 5.0 and file transfer utilities

386SX/20 VGA^{††}
Mono, 60 MB
\$1699

- ▼ Intel 80386SX 20 MHz
 - ▼ 2 MB RAM (Max to 16 MB)
 - ▼ 60 MB, 19 ms hard drive
- Plus all the great features which are standard on our 16 MHz Notebook!*



Compare our features and prices to theirs!

	Compudyne NBSX/16	ZEOS 386SX/16 Notebook	CompuAdd 316NX	Compudyne NBSX/20
CPU	Intel 386SX 16 MHz	Intel 386SX 16 MHz	Intel 386SX 16 MHz	Intel 386SX 20 MHz
Std. Memory	2 MB	1 MB	2 MB	2 MB
Max. Memory	16 MB	3 MB	6 MB	16 MB
CPU Cache	none	none	none	none
Hard Drive	40 MB IDE	20 MB IDE	30 MB IDE	60 MB IDE
I/O Ports	2 serial, 1 parallel monitor, keyboard	1 serial, 1 parallel monitor	1 serial, 1 parallel monitor, keyboard	2 serial, 1 parallel monitor, keyboard
Screen	9" 12 grey	10" 32 grey	10" 32 grey	9" 12 grey
Software	MS-DOS 5.0	none	MS-DOS 4.01	MS-DOS 5.0
Weight	6.5 lbs.	7 lbs.	6 lbs.	6.5 lbs.
Price	\$1499	\$1995	\$1995	\$1699

	ZEOS 386SX 20	Northgate 386SX 20	Compudyne NBSL/20	Zenith Mastersport 386SL
CPU	Intel 386SX 20 MHz	Intel 386SX 20 MHz	Intel 386SX 20 MHz	Intel 386SL 20 MHz
Std. Memory	1 MB	1 MB	2 MB	2 MB
Max. Memory	5 MB	5 MB	8 MB	8 MB
CPU Cache	none	none	64 k	64 k
Hard Drive	20 MB IDE	40 MB IDE	60 MB IDE	60 MB IDE
I/O Ports	1 serial, 1 parallel monitor	2 serial, 1 parallel monitor, keyboard	2 serial, 1 parallel monitor, keyboard	1 serial, 1 parallel monitor, keyboard
Screen	10" 12 grey	8.5" 12 grey	10" 64 grey	9" 12 grey
Software	none	MS-DOS 5.0	MS-DOS 5.0	MS-DOS 4.01
Weight	7 lbs.	6.1 lbs.	6.4 lbs.	6.8 lbs.
Price	\$2200	\$1795	\$1995	\$2000



Compudyne notebooks are also sold retail exclusively through CompUSA, the Computer SuperstoreSM.

COMPUDYNE

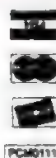
Compudyne Direct
 A unit of CompUSER, Inc.
 15151A Surveyor
 Addison TX 75244
 (214) 702-0055

Order Now
 Toll Free

1-800-932-COMP
 24 Hour FAX Line (214) 702-0300

Hours of Operation (CST)
 Mon-Fri 8 am - 7 pm
 Sat 9 am - 4 pm
 (800) 932-2667

*If you find a current lower advertised price in this publication, we will beat that price, guaranteed! Competitor must have stock at the published price. Shipping and surcharges will be calculated. Special manufacturers' rebates may not apply. Competitor's system must meet or exceed all Compudyne specifications to qualify. All returns must be in "as new" condition, with original packaging, complete. Prices and specifications subject to change without notice. ^{††}Intel 386[™] and the Intel Inside logo are trademarks of Intel Corporation. 1901-12-91



We will beat any adverti

Without sacrificing the services you expect...

Free on-site support from Texas Instruments**

The best in on-site support ensures you get the most from your system with the minimum amount of worry.

Toll-free technical support hotline

Our experts are ready to help you with any question, large or small.

30-day "no-questions-asked" return policy

If you're not satisfied for any reason with any purchase you make from us, return it within 30 days with no hassles.

Ready-to-ship configurations available

Place your order today and it's on its way the very same or next day.

Custom configurations are also available

We will build your system to any specification with the name-brand hardware and software of your choice. Choose from over 5000 products from suppliers such as NEC, Epson, and Microsoft at equally unbelievable prices.

Pre-loaded MS-DOS 5.0

Lets you get up and running fast!

Corporate credit and volume purchases

Just two ways we work with your company to give you the best service.



Compudyne systems are also
sold retail exclusively through
CompUSA,
the Computer SuperstoreSM



***Compare our prices to Gateway 2000, ZEOS and
others. We will always be lower...Guaranteed!***

sed price... Guaranteed!

Or the selection and quality you demand!

386SX/16^{††}
VGA Color, 40 MB HD
\$899

- ▼ Intel® 80386SX CPU
- ▼ 1 MB RAM
- ▼ 40 MB IDE hard drive
- ▼ 1.2 or 1.44 MB FD
- ▼ 16-bit Super VGA card
- ▼ 14" 640 x 480 VGA color monitor
- ▼ 1 parallel, 2 serial ports
- ▼ 101 keyboard

Business Lease from \$38/mo.*

386SX/20^{††}
VGA Color, 40 MB HD
\$999

- ▼ Intel 80386SX CPU
- ▼ 1 MB RAM
- ▼ 40 MB IDE hard drive
- ▼ 1.2 or 1.44 MB FD
- ▼ 16-bit Super VGA card
- ▼ 14" 640 x 480 VGA color monitor
- ▼ 1 parallel, 2 serial ports
- ▼ 101 keyboard

Business Lease from \$43/mo.*

386SX/20^{††}
Super VGA, 80 MB HD
\$1399

- ▼ Intel 80386SX CPU
- ▼ 2 MB RAM
- ▼ 80 MB IDE hard drive
- ▼ 1.2 and 1.44 MB FDs
- ▼ 16-bit SVGA w/ 1 MB
- ▼ 14" 1024 x 768 Super VGA color monitor
- ▼ 1 parallel, 2 serial ports
- ▼ 101 keyboard

Business Lease from \$53/mo.*

386DX/25^{††}
Super VGA, 80 MB HD
\$1599

- ▼ Intel 80386 CPU
- ▼ 2 MB RAM***
- ▼ 80 MB IDE hard drive
- ▼ 1.2 and 1.44 MB FDs
- ▼ 16-bit SVGA w/ 1 MB
- ▼ 14" 1024 x 768 Super VGA color monitor
- ▼ 1 parallel, 2 serial ports
- ▼ 101 keyboard

***Add \$75 for 32 K CPU cache
Business Lease from \$60/mo.*

386DX/33 Cache^{††}
Super VGA, 120 MB
\$1899

- ▼ Intel 80386 CPU
- ▼ 4 MB RAM, 32 K cache
- ▼ 120 MB IDE hard drive
- ▼ 1.2 and 1.44 MB FDs
- ▼ 16-bit SVGA w/ 1 MB
- ▼ 14" 1024 x 768 Super VGA non-interlaced color monitor
- ▼ 1 parallel, 2 serial ports
- ▼ 101 keyboard

Business Lease from \$71/mo.*

486SX/20^{††}
Super VGA, 120 MB
\$1999

- ▼ Intel 80486SX CPU
- ▼ 4 MB RAM
- ▼ Optional 256 K cache
- ▼ 120 MB IDE hard drive
- ▼ 1.2 and 1.44 MB FDs
- ▼ 16-bit SVGA w/ 1 MB
- ▼ 14" 1024 x 768 Super VGA non-interlaced color monitor
- ▼ 1 parallel, 2 serial ports
- ▼ 101 keyboard

Business Lease from \$75/mo.*

486DX/33 Cache^{††}
Super VGA, 120 MB
\$2499

- ▼ Intel 80486 CPU
- ▼ 4 MB RAM, 128 K cache
- ▼ 120 MB IDE hard drive
- ▼ 1.2 and 1.44 MB FDs
- ▼ 16-bit SVGA w/ 1 MB
- ▼ 14" 1024 x 768 Super VGA non-interlaced color monitor
- ▼ 1 parallel, 2 serial ports
- ▼ 101 keyboard

Business Lease from \$93/mo.*

Video Options:

- 14" Mono VGA
- 14" Color VGA
- 14" 1024 Interlaced Color VGA
- 14" 1024 Non/interlaced Color VGA
- 17" 1280 Non/interlaced Color VGA

Hard Drive Options:

- | | |
|--------|--------|
| 40 MB | 211 MB |
| 80 MB | 483 MB |
| 105 MB | 680 MB |
| 120 MB | 1.2 GB |

Internal CD-ROM
\$349 Includes
Groliers,
Toolworks and PC-SIG.

Internal Fax/Modem
\$99 9600 bps s/r fax,
2400 bps modem,
w/ WinFax & QuickLink.

 **COMPUDYNE**

Compudyne Direct
A unit of CompUSER, Inc.
15151A Surveyor
Addison TX 75244
(214) 702-0055

Order Now
Toll Free

1-800-932-COMP

24 Hour FAX Line (214) 702-0300

Hours of Operation (CST)
Mon-Fri 8 am - 7 pm
Sat 9 am - 4 pm
800/932-2667

*If you find a current lower advertised price in this publication, we will beat that price, guaranteed! Competitor must have stock at the published price. Shipping and surcharges will be calculated. Special manufacturers rebates may not apply. Competitor's system must meet or exceed all Compudyne specifications to qualify. All returns must be in "as new" condition with original packaging, complete. Prices and specifications subject to change without notice. **On-site service for customers located within a 100-mile radius of any "1" service center. **Notebooks excluded - replacement service only. *Leasing arranged through Leasing Group, Inc. Payments based on 36-month open-end lease. †Intel386™, Intel486™ and the Intel Inside logo are trademarks of Intel Corporation. 1901.12/91

CIRCLE 132 ON READER SERVICE CARD



PCMag 112

20 lb. copy paper



60 lb. text

80 lb. text



60 lb. marbled paper



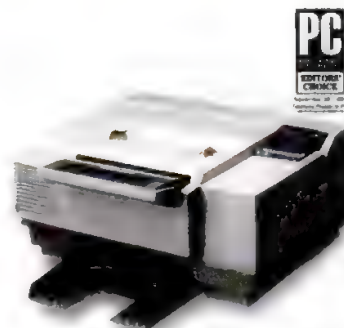
It can take any paper you feed it.

80 lb. cover



20 lb. yellow pages paper

60 lb. marbled vellum



Tektronix
The best and the brightest.

Have you ever wondered what your design would look like printed on a grocery bag? Okay, maybe not. But when you're working with a Phaser™ III color printer, your thoughts do tend to go a little wild.

Because you can feed the Phaser III any kind of paper, from 80 lb. bond to acetate. Even paper towels. It also takes sizes up to 12" x 18" for printing tabloid bleeds. And with 16.7 million colors delivered at 300 dpi, you get gorgeous color on any media.

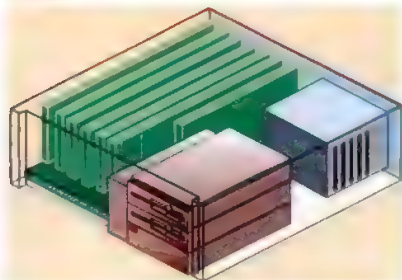
It's driven by a 24 MHz RISC chip with 10 MB RAM. Fast enough for you? And with Adobe's PostScript™ Language Level 2, your message will come out loud and clear.

The only thing you need is a well-fed imagination. Call 1-800-835-6100 Dept. 21E for your free output sample.



Phaser is a trademark of Tektronix, Inc. for color printers and related products. PostScript is a trademark of Adobe Systems Incorporated which is registered in the USA and other countries. Other marks are trademarks or registered trademarks of the manufacturers or marketers of the products with which the marks are associated.

CIRCLE 477 ON READER SERVICE CARD



Austin 486/SX20 Winstation
Austin Computer Systems, 10300 Metric Blvd.,
Austin, TX 78758; 800-752-1577.
List price (tested configuration): \$3,290.
Memory and processor RAM cache: 8MB
70-ns. SIMMs, 256K cache.
Disk drives and controller: Western Digital
sub-16-ms. 212MB IDE hard disk, 1.2MB and
1.44MB floppy disk drives.
Display: Diamond 1,024-by-768 adapter with
1MB RAM, Relisys 15-inch monitor.
Monitor refresh rate: 70 Hz.
Software: DOS 5.0, Microsoft Windows 3.0,
SMARTDRV.SYS.

CIRCLE 415 ON READER SERVICE CARD

Also integrated on the motherboard are the hard disk's IDE adapter, the floppy disk controller, and I/O ports (though not the mouse port).

Austin equipped our test unit with the high-performance sub-16-millisecond Western Digital Piranha 4200 IDE hard disk, which performed above average on our disk test. SMARTDRV.SYS boosted the hard disk's speed by 18 percent, about average for the group.

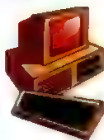
On our processor and memory tests, the Austin 486/SX20 Winstation came in among the top performers. On our video test, the Winstation's Diamond Speed-Star video adapter and Tseng chip set turned in the fastest video score. But the Relisys monitor's 60-Hz refresh rate at 1,024-by-768 resolution was just short of easy on the eyes.

As with any system, some areas of the 486/SX20 need attention. The motherboard flexes more than it should and contains too many engineering-change wires (about a dozen).

Austin sells direct and through VARs. The company offers a 30-day money-back guarantee, on-site repair through GE Computer Services for the first year, and unlimited toll-free telephone support weekdays from 6:00 to 9:00 and Saturdays from 9:00 to 5:00 C.S.T.

BLACKSHIP COMPUTER SYSTEMS INC. Blackship 486SX/20U

by Bruce Brown

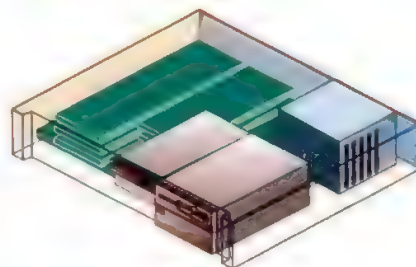


With the poor memory and video performance we noted on the Blackship 486SX/20U, this system would be difficult to endorse, regardless of its reasonably low price.

The \$3,095 cost for our standard configuration includes 8MB of RAM, a 200MB 15-millisecond Maxtor IDE hard disk, 1.2MB and 1.44MB floppy disk drives, a Super VGA color display subsystem, and DOS 5.0. The 14-inch 0.28-mm.-dot-pitch ViewSonic 6 monitor that came with this system has a 70-Hz refresh rate. Blackship Computer Systems also sells a \$2,495 base-priced system with 4MB of RAM, a 64K RAM cache, a 120MB hard disk, 1.44MB and 1.2MB floppy disk drives, and a Super VGA monitor and adapter.

As with many of the systems in this review, you'll do better to buy the 486/33 version of this machine in the first place. At \$3,395, it costs only \$300 more than the 486SX/20U in the same configuration. For \$200 less, or \$2,895, you can buy a 386/33.

Upgrade costs for this computer vary with CPU market price. Blackship gives

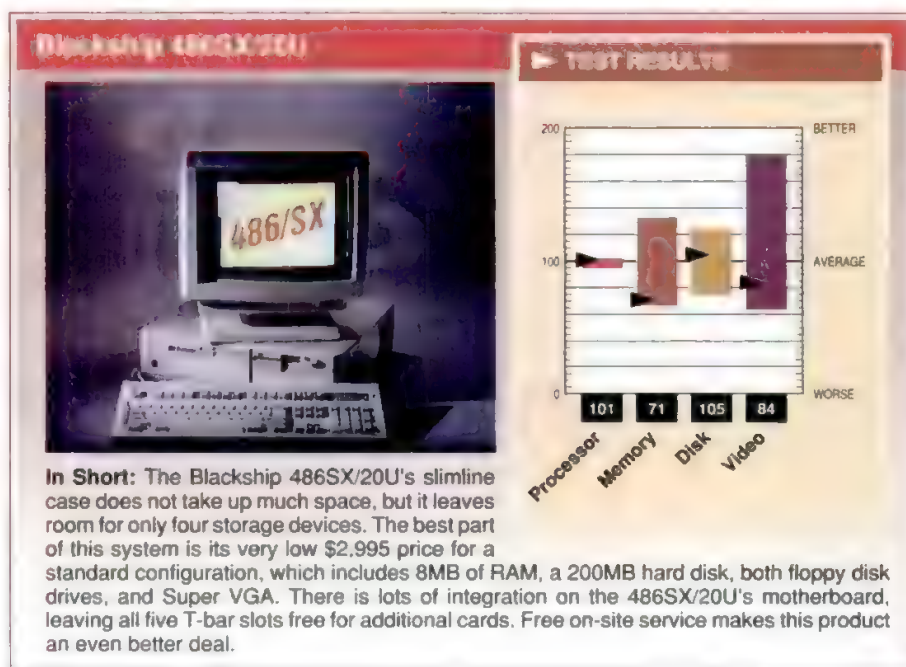


Blackship 486SX/20U
Blackship Computer Systems Inc., 2031
O'Toole Ave., San Jose, CA 95131;
800-531-7447, 408-432-7500.
List price (tested configuration): \$3,095.
Memory and processor RAM cache: 8MB
70-ns. SIMMs, 64K cache.
Disk drives and controller: Maxtor 15-ms.
200MB IDE hard disk, 1.2MB and 1.44MB
floppy disk drives.
Display: ATI 1,024-by-768 adapter with 512K
RAM, ViewSonic 14-inch monitor.
Monitor refresh rate: 70 Hz.
Software: DOS 5.0, SMARTDRV.SYS.

CIRCLE 416 ON READER SERVICE CARD

you a 50 percent credit on the current market value of the processor module you trade in. Hence, with a \$300 trade-in credit on the \$600 486SX and the current \$1,100 price of the upgrade module, you can go from a 486SX/20 to a 486/33 for a net cost of \$800.

The motherboard, an upgradable design from Motherboard Factory, can use



If you're in the market for a machine in the 486SX category, the C² Micro 486SX's configuration is quite viable for the \$3,495 price.

processor module cards in any currently available 386DX, 486DX, or 486SX platform. This motherboard exhibited a conventional-memory problem that was attributed to a cache controller chip from Northport and was also found in PCs from Ares and Hyundai. RAM is expandable to 32MB on the motherboard using 4MB 70-nanosecond SIMMs. The 64K 25-ns. external RAM cache is controlled by discrete logic and expandable to 256K.

The motherboard will take either an 80487SX or Weitek math coprocessor on the processor module, but not both—a trade-off that shouldn't bother anyone in the market for a 486SX. The motherboard also contains the drive interfaces, I/O port circuitry, and a Super VGA chip set supported by 512K of video RAM. Note that the 486SX/20U's speed on our memory test was substantially below average.

The 486SX/20U's slimline case holds four drive bays: two horizontal half-heights and two vertical 3.5-inch bays, all of which are accessible from the front. The motherboard has five expansion slots on its I/O tree (two 8-bit and three 16-bit); all were empty in the system tested.

The 486SX/20U's score on our processor test was average. But on the memory test it placed second from last, tying with the Ares 486-20SX Sonic. On our disk test, the 486SX/20U's score was a few points faster than average. Despite the video chip set on the motherboard, the video test score was on the slow side.

Blackship sells through direct mail only and includes free on-site service via GE Computer Services during the standard one-year parts-and-labor warranty period. Coverage for additional years is available for 15 percent of the original system cost per year.

If you like the slimline form factor

COMPUTERS

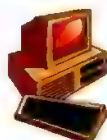
486SX/20s

with its expansion-card tree, and if you can live with the limits of four storage devices and with the price/performance realities of a 486SX CPU, you can probably get by with this computer. But better value is found in the 386/33 and 486/33 varieties.

C² MICROSYSTEMS INC.

C² Micro 486SX

by Bruce Brown



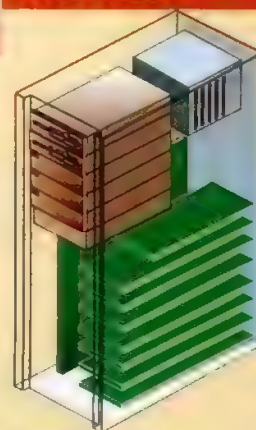
There are no surprises with the C² Micro 486SX. The system comes in a mini-tower case and has typical expansion room and average performance overall. If you're in the market for a machine in the 486SX category, this system's configuration is quite viable for the price.

The C² Micro 486SX costs \$3,495 for our standard configuration of 8MB of RAM, a 256K 20-nanosecond RAM cache (expandable to 1MB), a 213MB Conner hard disk, 1.2MB and 1.44MB floppy disk drives, and a matched 1,024-by-768-resolution noninterlaced adapter and monitor, and DOS 5.0 and *Microsoft Windows* 3.0. A basic configuration with the same features except for an 80MB hard disk costs \$3,195.

The mini-tower case stacks six 5.25-inch half-height bays in front, with the top



FACT FILE



C² Micro 486SX

C² MicroSystems Inc., 47448 Fremont Blvd., Fremont, CA 94538; 415-683-8888.

List price (tested configuration): \$3,495.

Memory and processor RAM cache: 8MB 70-ns. SIMMs, 256K cache.

Disk drives and controller: Conner 17-ms. 213MB IDE hard disk, 1.2MB and 1.44MB floppy disk drives.

Display: Pixel 1,024-by-768 adapter with 1MB RAM, ADI 14-inch monitor.

Monitor refresh rate: 56 Hz.

Software: DOS 4.01, *Microsoft Windows* 3.0, SMARTDRV.SYS.

CIRCLE 417 ON READER SERVICE CARD

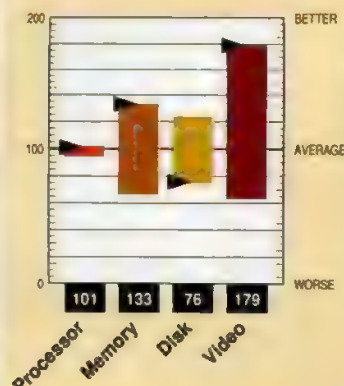
five capable of holding removable media. The IDE hard disk and floppy disk drive interfaces are incorporated on the motherboard, which also has eight expansion slots: one for 8-bit only and seven for either 8-bit or 16-bit ISA cards. In the tested system, six slots were free, and two were

C² Micro 486SX



In Short: The C² Micro 486SX's performance is in most cases at the top of the list, compared with others in this review, but the most interesting part of this \$3,495 unit is its ability to use a 486DX chip in its performance upgrade socket (when you change two motherboard jumpers). Though the Micro 486SX is sold through dealers only, a one-year on-site service contract is standard.

TEST RESULTS



filled by the I/O and video adapter cards.

You can even upgrade this system yourself: Pop out the old CPU and processor clock crystal (C² MicroSystems supplies a chip remover), insert the new units, change two jumpers on the motherboard, and you're off. (The motherboard does not have Intel's upgrade socket.) For a \$75 upgrade fee plus the cost of the CPU chip, C² MicroSystems dealers will do it for you. With the 486DX/25 selling for \$495 and the 486DX/33 for \$525, the latter is the obvious choice.

Video, drive interfaces, and port circuitry are built into the Dell motherboard. This helps speed signals and frees slots.

The C²'s motherboard, made by Magnum, has an AMI BIOS and a Symphony Labs chip set for the RAM cache. Motherboard RAM is expandable from 1MB to 64MB using 4MB 70-nanosecond SIMMs. These and the 20-ns. RAM cache chips, both slightly faster than average, gave the C² an edge on the PC Labs' memory test, where it tied with three other systems for first place.

Despite turning in the fastest score on our memory test, the C² made merely an average showing on our processor test. Its score on our disk test was the third-slowest in our test group.

If you like this system but want a better deal, buy an identically configured 386/33 from C² MicroSystems for only \$2,675. It costs about \$800 less than the 486SX and could be 5 to 10 percent faster in terms of timing.

C² MicroSystems sells through dealers; at the time of this review, discounts were running about 10 percent. With street prices approaching \$3,000, the C² Micro 486SX is competitive with many mail-order systems. A year of on-site service from Nationwide Warranty Corp. is included in the price. C² MicroSystems provides technical support via a toll number during weekday business hours.

COMPUTERS

486SX/20s

The C² Micro 486SX comes in an attractive case and has a reasonable amount of expansion room, but otherwise it is just another entry in the somewhat dubious 486SX category. Do yourself a favor and buy the 386/33 or the 486/33 instead.

DELL COMPUTER CORP.

Dell PowerLine 420DE

by Bruce Brown



Dell Computer Corp. is positioning its Dell PowerLine 420DE as an entry-level machine for those who want EISA in a 486-family platform. But even the PowerLine's solid design and construction don't justify its relatively high price.

The PowerLine costs \$4,588 for the standard configuration we requested: 8MB of RAM, a 200MB 15-millisecond Maxtor IDE hard disk, 1.2MB and 1.44MB floppy drives, a 1,024-by-768-resolution noninterlaced video display and adapter, and DOS 5.0 installed but without DOS floppy disks. The system came with a 14-inch monitor that had a 70-Hz refresh rate. The same configuration with 4MB of RAM and Super VGA costs \$4,188.

When compared with other Dell systems, the PowerLine is logically priced: Dell charges \$4,288 for a similarly configured ISA-bus 386/33 and \$5,488 for a

486/33 EISA system. A Dell 486/50 costs \$7,488.

Dell uses its own motherboard with a combination Phoenix/Dell ROM BIOS and an Intel chip set. Using six 8MB 80-nanosecond SIMMs plugged directly into the motherboard, a total of 48MB RAM is possible—a generous amount to have if you can find the parts. The motherboard has no external RAM cache. It supports an Intel 80487SX math coprocessor but not a Weitek.

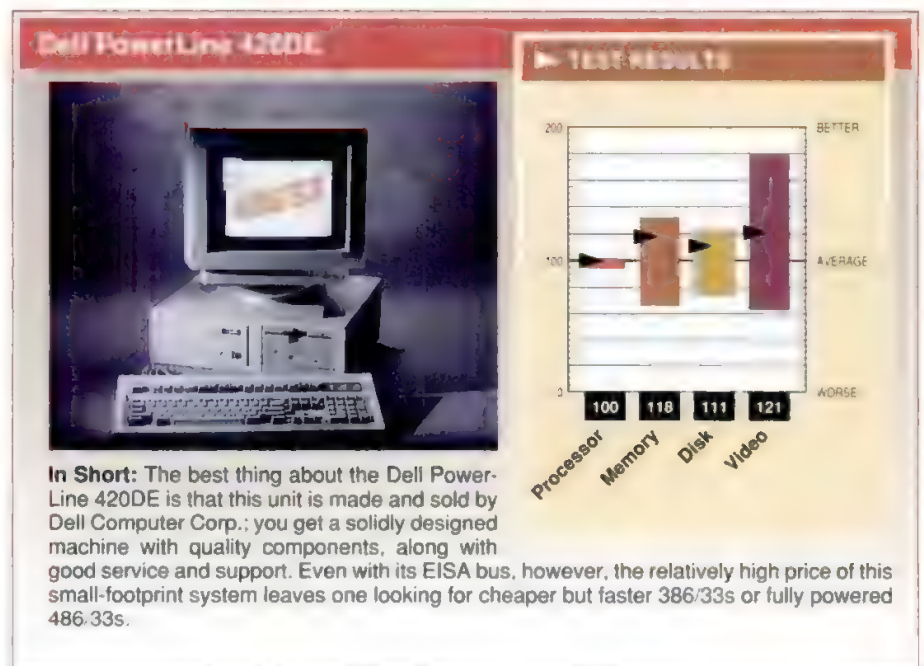
Dell lets you upgrade to a 50-MHz or 33-MHz 486 via a DX processor module that fits into a proprietary slot. Though you can do the upgrade yourself, it is a costly venture by any standard.

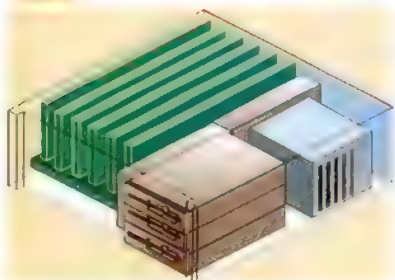
Even with the return of the original module, you will pay \$1,999 for the 486/33 processor module or \$2,699 for the 486/50 module. Other manufacturers have found less expensive ways to let you perform the same upgrade.

The motherboard has six EISA interface card slots, none of which we needed to use in the test machine due to the high degree of component integration on the motherboard. Video, drive interfaces, and port circuitry (including a mouse port) are all conveniently built into the Dell motherboard; this helps with signal speed and frees up the card slots for special extras you may wish to use.

ROOM TO EXPAND

Expansion room is abundant, considering the PowerLine's small-footprint case.



**Dell PowerLine 420DE**

Dell Computer Corp., 9505 Arboretum Blvd., Austin, TX 78759; 800-289-3355, 512-338-4400.

List price (tested configuration): \$4,588.95.

Memory and processor RAM cache: 8MB 80-ns. SIMMs, 8K cache.

Disk drives and controller: Maxtor 15-ms. 200MB IDE hard disk, 1.2MB and 1.44MB floppy disk drives.

Display: Western Digital 1,024-by-768 adapter with 512K RAM, Dell 14-inch monitor. **Monitor refresh rate:** 70 Hz.

Software: DOS 5.0, SMARTDRV.SYS.

CIRCLE 418 ON READER SERVICE CARD

Along with the stack of three 5.25-inch drive bays located on the front of the machine, there is also a single internal 3.5-inch bay that can host an optional bracket for a second internal drive. Five storage device bays with external access to three is probably adequate; but if you want two floppy disk drives, a tape drive, and a CD-ROM drive, then one unit will need an external case.

The PowerLine's performance on our processor test matched the average for the group, but its scores on the memory, disk, and video tests were faster than the average.

FAMOUS SUPPORT

Dell's service and support, for which the company is justifiably famous, includes toll-free technical help and no-cost on-site service through Xerox service centers during the standard one-year parts-and-labor warranty. Three years of additional on-site service cost approximately 10 percent of the original system price per year.

If you want a Dell system and need EISA, the deal is not bad. But for now, if you're planning to keep your system on your desktop, there's no reason to buy this machine: You can find similar ISA systems from other direct-mail merchants for \$2,000 less.

ERGO COMPUTING INC.**Moby Brick
486SX-20**

by John R. Quain



If style were a PC commodity, Ergo Computing would corner the market. Ergo's rubber-cornered, granite-black ISA system, the Moby Brick 486SX-20, is a unique blend of sophisticated features and sex appeal. The 9-pound, 3.25-by-11.25-by-7.9-inch Moby Brick can be detached from its monitor and keyboard, tossed into a briefcase along with its power adapter (there's no rechargeable battery), and used anywhere there is a monitor and keyboard available. An average performer on PC Labs' tests, the Moby Brick's main appeal is to users who want the greatest computing power in the smallest package available.

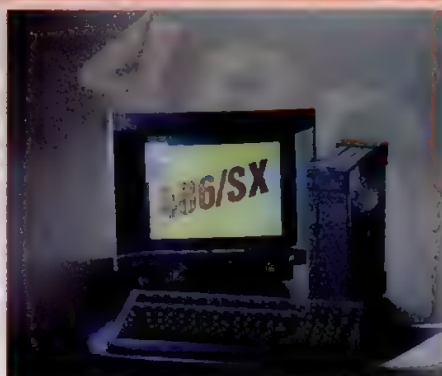
The Moby Brick is one of the more expensive i486SX-based PCs in this roundup: It costs \$6,249 for a system in our standard configuration with 8MB of 80-nanosecond RAM (expandable to 32MB), a 202MB Conner CP320F hard disk, an external 1.2MB floppy disk drive, an internal 1.44MB floppy disk drive, and a 15-inch MAG monitor. Standard features include DOS 5.0, *Microsoft Windows* 3.0 with Adobe ATM, and a two-

button black Logitech mouse. Buyers have the option of substituting *DESQview/386* (with *QEMM* and *Tree86*) for *Windows*. Also standard is an internal 2,400-bps modem with a "ringpower" utility that allows remote access to the Moby Brick.

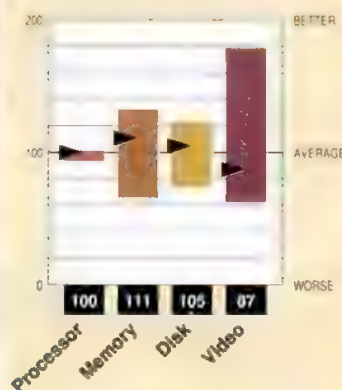
Removing the aluminum sheath of the Moby Brick without disturbing its internal components is a tricky maneuver. But once this is accomplished, users will appreciate the full-desktop power that Ergo has squeezed inside. Below the two drive bays are two boards: a CPU board with a VLSI chip set and a peripherals board lying above the CPU board on short stanchions. A short vertical backplane contains two half-length expansion slots (one 8-bit slot occupied by the external floppy disk drive adapter and one free 16-bit slot). Beneath the snug array of boards is a heat sink pack made of liquid-filled plastic, which assists the unit's tiny but quiet fan in diffusing heat.

Among the Moby Brick's numerous software features is its programmable BIOS. With upgrades available from Ergo's BBS, the BIOS setup offers options such as adjustable keyboard speed; you can also change the boot sequence, shadow RAM settings, and password. The password-protection feature stores a 70-character message in nonvolatile RAM. Three incorrect password attempts by a would-be thief will lock up the hard disk and display your message on-screen.

A unique feature among the products reviewed: Ergo's BIOS also contains

Ergo Moby Brick 486SX-20

In Short: A unique transportable black box, the \$6,249 Moby Brick 486SX-20 delivers average performance in an above-average package. Its uniqueness extends under the surface to include a BIOS-resident disk cache, which managed to keep pace on our tests. Replete with a programmable BIOS, an internal modem, and an MAG Computronic monitor, the Moby Brick is a pleasure to operate, though many will find paying for it somewhat less enjoyable.

TEST RESULTS

NOW YOU CAN BE OUT IN THE FIELD,
BUT NOT OUT OF TOUCH.



Safari NSX/20
Notebook Computer

Mobile Computing. It's the hot new buzzword for people whose business takes them out of the office. But when it comes to connectivity, you can find yourself stranded.

That's where the AT&T Safari comes in. It's the first notebook PC designed for *Mobile Networked Computing*, so you can network anywhere, to anyone. With the 386SX power you need to run most any application. An integrated modem and optional pocket LAN adapter for wired communication. And innovative *Mobile Mailbox* data pager for wireless E-mail, plus cellular modem to deliver two-way connectivity.

See how easy it can be to stay in touch in the field. Just contact your nearest authorized Safari reseller by calling 1-800-247-1212, ext. 836K.

POWERFUL 20MHz 386SX PROCESSOR • 4MB DRIVE WITH 2 TO 8 MB OF RAM OR 8MB DRIVE WITH 4 TO 8 MB OF RAM • 1.44MB FLOPPY DRIVE
COMMUNICATES FROM ANYWHERE INTEGRATED 2400BPS MODEM (40MB VERSION) • INTEGRATED 2400BPS DATA/9600BPS FAX CELLULAR MODEM
(8MB VERSION) • POCKET LAN ADAPTER • MOBILE MAILBOX (WIRELESS E-MAIL) **EASY TO USE** DUAL BATTERY PACK (UP TO SIX HOURS OF OPERATION) •
PORTABLE MOUSE • PRELOADED SOFTWARE: MS-DOS 4.01, MS-WINDOWS 3.0, AT&T MAIL, TOURGUIDE TUTORIAL, UTILITIES

Safari is a registered trademark of AT&T. All other product names are trademarks or registered trademarks of their respective companies.

S
A
F
A
R
I

PORTABLE
SOLUTIONS



2400 BPS DATA MODEM BUYERS: LOOK FOR THE SENDFAX™ SEAL.



If you've decided to buy a data modem to tap into information services and free bulletin boards, or move data between computers, be sure to look for the Sendfax seal on the package. With Sendfax, you'll get everything you want in a data modem, plus a *big* bonus. You'll be able to send faxes directly from your personal computer.

No more need to print hard copy first. No more trudging to the fax machine, waiting in line, or standing there feeding in paper.

If you only send faxes now and then, the silver Sendfax seal means you'll get all the advantages of instant, direct faxing on your data modem at little or no extra cost. If you're a frequent faxer, go for the gold. For a few dollars more, it's so fast (9600 bps) it can pay for itself the first few times you use it. By programming faxes to go at night rates, you'll save 40% or more on your phone bill. If you send a lot of long distance faxes, that adds up fast. And since modems don't wear out, it will add up for a long time.

Sendfax is available on the best quality data modems through your local computer retailer or direct mail marketer.

**For the location of the Sendfax dealer
nearest you, call 800-338-7554, extension 201**

Dealer inquiries regarding the Sierra Sendfax program
are invited. Call 800-338-7554, extension 801

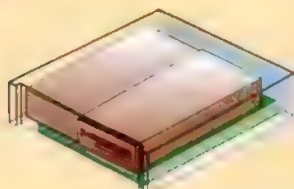


SIERRA SEMICONDUCTOR

2075 North Capitol Avenue, San Jose, California 95132

CIRCLE 740 ON READER SERVICE CARD

FACT FILE

**Moby Brick 486SX-20**

Ergo Computing Inc., One International Way,
Peabody, MA 01960; 800-633-1925.

List price (tested configuration): \$6,249.

Memory and processor RAM cache: 8MB
80-ns. SIPs, 8K cache.

Disk drives and controller: Conner 16-ms,
202MB IDE hard disk, 64K cache controller,
1.2MB and 1.44MB floppy disk drives.

Display: Chips and Technologies 1,024-by-
768 adapter with 1MB RAM, Mag Computronic
15-inch monitor.

Monitor refresh rate: 72 Hz.

Software: DOS 5.0, Microsoft Windows 3.0,
Aldridge Cache86-ROM.

CIRCLE 419 ON READER SERVICE CARD

Aldridge Cache86 hard disk RAM cache software. Cache adjustments, such as the amount of RAM used, can be made through the BIOS setup.

The Conner hard disk performed well, and the processor scores were average among the nearly indistinguishable results. Just a shade faster than average, memory performance was not handicapped by the lack of an external RAM cache.

On the other hand, the Moby Brick was one of the five slowest video performers. But its Chips and Technologies Super VGA chip set was far from the worst in our tests. It is able to reach a Super VGA vertical refresh rate of 72 Hz and a top noninterlaced resolution of 1,024 by 768 pixels, an ideal match for the slick black 15-inch-diagonal MAG Colorview/15 monitor (an Editors' Choice winner in *PC Magazine*, "Super VGA Monitors," July 1991). The MAG features front-panel digital controls for precise vertical and horizontal image adjustment and has no trouble equaling the video capabilities of the Chips and Technologies chip set.

Other ergonomic extras include a reduced-size German-made Cherry keyboard with quiet but firm key travel, and options such as an LCD screen (\$995) and brackets for stowing the Moby Brick under your desk (\$39). A \$395 docking station with a 16-bit expansion slot adds further convenience.

Competing in a field where 486SX and 386DX machines cost half as much as the Moby Brick, Ergo still carries its weight in terms of performance, excellent documentation, and service (one-year parts and labor with toll-free technical support). But the unit's restricted expandability and steep price mean that this little black box will appeal mainly to style-conscious executives and space-conscious power users.

EVEREX SYSTEMS INC.**Everex Tempo
486SX/20**

by Joseph Desposito



The Everex Tempo 486SX/20, from Everex Systems, is one of the higher-priced systems reviewed here. The system gets good marks for its external processor RAM cache, even though a throughput problem exists with the video performance.

The \$5,172 Tempo 486SX/20 came equipped with 8MB RAM, 128K cache RAM, a 210MB Maxtor hard disk, 1.2MB and 1.44MB floppy disk drives, Super VGA card and display, and DOS 5.0.

A small-footprint unit, the Tempo 486SX has eight ISA slots (six 16-bit and two 8-bit) and room on the motherboard

for up to 32MB RAM. Serial and parallel ports are on a multi I/O card; the IDE interface and floppy disk controller are on a separate card. A sliding transparent plastic door covers a panel of switches inset into the front face of the machine. The switches allow manual resetting, changing speeds from 20 MHz to 8 MHz, and turning the speaker on and off.

The monitor supplied with the review system, the EverSync/SVGA, supports VESA 800-by-600 resolution at 60 Hz. The Super VGA board included with our test system was the Everex Viewpoint Standard VGA card.

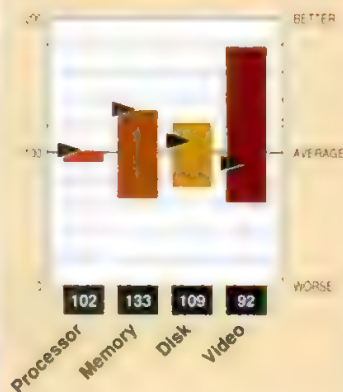
The Tempo 486SX/20 garnered top scores on our processor and memory tests due to its 20-nanosecond cache chips and proprietary cache controller. The system also scored above average in disk performance.

The only area in which the Tempo's performance fell below average was the video test: The unit failed to provide optimum throughput to the Everex Viewpoint Standard VGA board. PC Labs' tests indicated that the problem was caused by the Everex motherboard. When the Viewpoint video board was removed and placed in another machine, it actually performed better. But when we substituted another board for the Viewpoint in the Tempo 486SX/20, the same slowdown was seen. A replacement motherboard sent to us by Everex had the same problem.

It is difficult to compare the Tempo 486SX/20 with other members of the

Everex Tempo 486SX/20

In Short: The Everex Tempo 486SX/20 rates high marks for processor and memory performance, thanks to 20-nanosecond cache chips and a proprietary cache controller. Also notable is the above-average performance of the Maxtor LXT213A hard disk. A suspected motherboard problem, however, caused less than optimum video throughput. This system seems overpriced for what it offers.

TEST RESULTS

A suspected motherboard problem, however, caused less than optimum video throughput. This system seems overpriced for what it offers.



**IF A
NOTEBOOK**

**WAS A
NOTEBOOK**

\$4,199

\$2,995

Performance Enhancements: Within the first megabyte of memory, 384 KB of memory is reserved for use by the system to enhance performance. Can be optionally disabled. All prices
◇ Leasing arranged by Leasing Group, Inc. In Canada and Mexico, configurations and prices may vary. i386 and the Intel Inside Logo are trademarks of Intel Corporation. Other trade-
and trade names other than its own. Shipping, handling and applicable sales tax not included in the price. For information on and a copy of Dell's 30-day Total Satisfaction Guarantee

If the one on the right immediately caught your eye, we don't blame you. After all, who wouldn't jump at a great bargain?

But if it's just the price that surprises you, listen



THE NX20 FROM DELL 20 MHz i386SX SYSTEM. SYSTEM INCLUDES 40 MB HARD DRIVE, VGA BLACK AND WHITE DISPLAY, AND 2 MB RAM.

to this: the NX20 from Dell is the *most* notebook you can get anywhere for \$1,899.

Weighing in at just 6.8 pounds, the NX20 is packed with features normally found on more expensive machines. Like a 3.5" floppy drive and a big 8.5" VGA black and white display.

**WAS A
NOTEBOOK,**

**WHICH ONE
WOULD YOU CHOOSE?**

On the road, this little powerhouse packs all the punch that an i386™ SX system running at 20 MHz can deliver. And to complement that power, there's 2 MB of RAM expandable to 6 MB and a choice of 40 or 60 MB hard drives.

So why choose between quality and economy when you can get both by choosing the NX20 from Dell? Call us today.

Because decisions this simple don't come by everyday.

TO ORDER CALL PLEASE REFERENCE #11BP4

800-626-4388

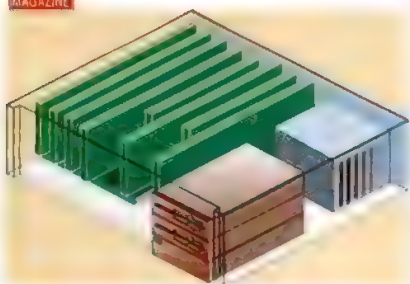
HOURS 7AM-9PM CTM-F 8AM-4PM CTSAT 10AM-3PM CTSUN

IN CANADA 800-668-3021 IN MEXICO 95-800-010-0664

**DELL
COMPUTER
CORPORATION**

and specifications are subject to change without notice. Dell cannot be responsible for errors in typography or photography. **Payment based on 36-month, open-end lease. marks and trade names are used to identify the entities claiming the marks and names of their products. Dell Computer Corporation disclaims any proprietary interest in trademarks and limited warranty, please write to Dell USA Corporation, 9505 Arboretum Boulevard, Austin, Texas 78759-7299, ATTN: Warranty. ©1991 Dell Computer Corporation. All rights reserved.

CIRCLE 480 ON READER SERVICE CARD

**Everex Tempo 486SX/20**

Everex Systems Inc., 48431 Milmont Dr.,
Fremont, CA 94538; 800-356-4283,
510-498-1111.

List price (tested configuration): \$5,172.

Memory and processor RAM cache: 8MB
80-ns. SIMMs, 128K cache.

Disk drives and controller: Maxtor 15-ms.
210MB IDE hard disk, 1.2MB and 1.44MB
floppy disk drives.

Display: Everex Super VGA adapter with
256K RAM, Everex 14-inch monitor.

Monitor refresh rate: 56 Hz.

Software: DOS 5.0, Microsoft Windows 3.0,
SMARTDRV.SYS.

CIRCLE 420 ON READER SERVICE CARD

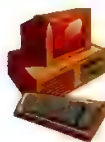
Everex product line, since competing units are members of Everex's higher-priced, high-performance STEP line. For example, the STEP 386/33 lists for \$17 more than the Tempo 486SX/20.

The Tempo 486SX/20 comes with a one-year warranty on parts and labor. Also included is three months of on-site service from National Computer Systems, which has about 120 locations nationwide. An additional nine months of on-site service costs \$80.

For a system that lists for over \$5,000, the Everex Tempo 486SX/20 excels in processor and memory performance but falls short on video. If you are interested in a 486SX/20 ISA-bus machine, there are better choices for the price.

HYUNDAI ELECTRONICS AMERICA Hyundai Corporate Series 486SX/20

by Joseph Desposito



Upgradability and expandability are the key features of the Hyundai Corporate Series 486SX/20. But its below-average results on PC Magazine Labs' bench-

COMPUTERS

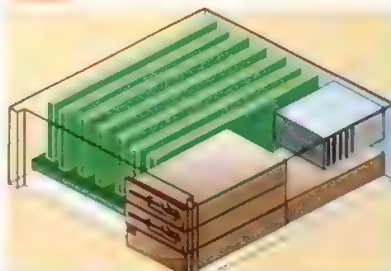
486SX/20s

mark tests and the unorthodox placement of its hard disk make this Hyundai model difficult to recommend.

To meet PC Magazine's standard configuration, the 486SX/20 came equipped with 8MB of RAM, a 64K external RAM cache, a 200MB Conner hard disk, a Super VGA card and display, and DOS 5.0. The monitor was a 14-inch Hyundai Super VGA model with a 56-Hz refresh rate. This system has a suggested list price of \$4,884.

The Corporate Series line includes three models: a 486SX/20, 486DX/33, and 386DX/40. Each one uses a different processor module, which fits into a proprietary slot on the motherboard and includes either an Intel or AMD processor, a socket for an Intel or Weitek coprocessor, and a 64K 25-nanosecond static RAM cache. The 486SX/20 module lists for \$1,215, the 486DX/33 for \$1,695. You can upgrade the static RAM cache to 256K.

The chassis of the 486SX/20 has a snap-together construction held together with one screw. It's easy to snap off the top panel and get at the computer's innards. It is a little harder, however, to reach the hard disk, which is tucked underneath the power supply. To remove the drive, you must first dislodge the power supply by removing four screws. You can mount an additional hard disk to a bracket attached to the side of the floppy disk

**Hyundai Corporate Series 486SX/20**

Hyundai Electronics America, 166 Baypointe Pkwy., San Jose, CA 95134; 408-473-9200.

List price (tested configuration): \$4,884.

Memory and processor RAM cache: 8MB

80-ns. SIMMs, 64K cache.

Disk drives and controller: Conner 16-ms.
200MB IDE hard disk, 1.2MB and 1.44MB
floppy disk drives.

Display: ATI 1,024-by-768 adapter with 256K
RAM, Hyundai 14-inch monitor.

Monitor refresh rate: 56 Hz.

Software: DOS 5.0, Microsoft Windows 3.0,
SMARTDRV.SYS.

CIRCLE 421 ON READER SERVICE CARD

drive bays.

The 486SX/20 motherboard has seven 16-bit ISA expansion slots, which is a generous amount. You can also expand memory up to a total of 64MB by adding as many as 16 4MB SIMMs to the motherboard.

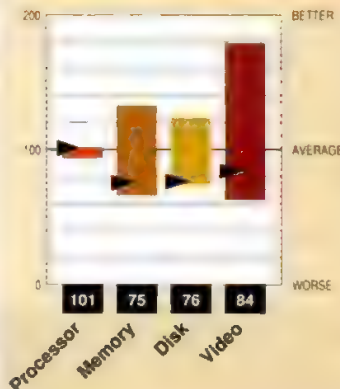
Like the Blackship 486SX/20U, which also had a Motherboard Factory motherboard and processor module, this Hyun-

Hyundai Corporate Series 486SX/20

TEST RESULTS

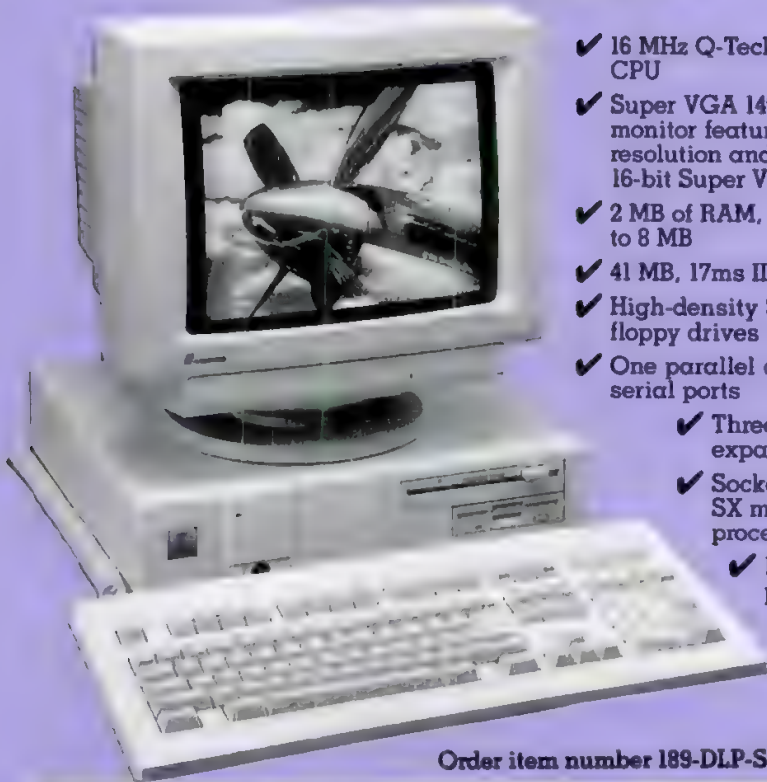


In Short: The Hyundai Corporate Series 486SX/20 placed near the bottom on the memory, disk, and video benchmark tests. These scores are due to its Northport chip Conner IDE hard disk, and ATI video card (known more for its Microsoft Windows performance than its text-based video speed). The system is upgradable to a 486/33 with the purchase of a processor module, and is expandable to 64MB of RAM.



COMPLETE 386-SX

\$1399



- ✓ 16 MHz Q-Tech® 386-SX CPU
- ✓ Super VGA 14" color monitor featuring 800x600 resolution and on-board, 16-bit Super VGA adapter
- ✓ 2 MB of RAM, expandable to 8 MB
- ✓ 41 MB, 17ms IDE hard drive
- ✓ High-density 3½" and 5¼" floppy drives
- ✓ One parallel and two serial ports
- ✓ Three 16-bit expansion slots
- ✓ Socket for 80387-SX math co-processor
- ✓ 165-watt power supply

Order item number 189-DLP-SX16-1 .. \$1399

POWERFUL 33 MHz 386 SYSTEM

\$2699



- ✓ 33 MHz Q-Tech® 386 CPU
- ✓ Super VGA color monitor and video adapter
- ✓ 200 MB hard drive, PLUS high-density 3½" and 5¼" floppy drives
- ✓ 64K RAM cache

Order item number 189-DLP-38633-1 \$2699

Q-TECH® LITE 386-SX NOTEBOOK PC

\$1999



- ✓ 20 MHz CPU for 32-bit processing
- ✓ 16-shade VGA display on a 10" backlit LCD screen
- ✓ 20 MB hard drive (also available with 40 or 60 MB drive)
- ✓ Rechargeable battery and universal AC adapter
- ✓ 1 MB of RAM, expandable to 5 MB
- ✓ High-density 3½" floppy drive

Order item number 189-LSX-20/20...\$1999

PLUS, QUILL'S "WE CARE" SERVICE

90-DAY, NO-RISK GUARANTEE

... You won't find a better guarantee anywhere else!

FREE TECHNICAL SUPPORT

... You'll get knowledgeable, friendly and prompt telephone support for as long as you own your system.

35 YEARS OF EXPERIENCE IN THE OFFICE PRODUCTS INDUSTRY

... You know we'll be there when you need us!

EASY PAYMENT OPTIONS

... Using your Visa or MasterCard. Qualified businesses can also choose our convenient monthly payment plan or be billed on open account.

LARGE-VOLUME QUOTES

... Need several systems? We'll quote you a special price.

SPEEDY DELIVERY

... Ships your order within 24 hours after credit approval.

ONE-STOP SHOPPING

... You'll find the system that meets your needs, as well as a full selection of peripherals and supplies, all at low, low prices... EVERY DAY!

WITH EVERY Q-TECH PC, YOU GET:

- ✓ FREE MS-DOS 5.0
- ✓ FREE one-year service program
- ✓ FREE two-button mouse
- ✓ 24-hour burn in
- ✓ FREE Windows 3.0
- ✓ Intel® processor for 100% IBM compatibility



CALL US TODAY

... for information on all of our value-packed systems, or to request a catalog. Please refer to ad code #91183 when you call.

708-634-6650

QUILL®

P.O. Box 4700 • Lincolnshire, IL 60137-4700 © Copyright 1991, Quill Corporation

dai PC turned in subpar results on all our benchmark tests—except for the processor test, for which the 486SX/20's score was average. On our memory test, its slow time was attributed to a problem with the chip set, which includes a Northport Technology chip. This chip set yielded slower memory scores for two other machines as well. A spokesperson for Hyundai could not confirm the problem, since it did not show up with Hyundai's testing software.

The 486SX/20's Conner 3204 IDE hard disk turned in a slow time on our disk test, and the ATI VGA Wonder XL card shipped with the system turned in a below-average result on the video test.

Hyundai offers an 18-month warranty on parts and labor, which is a good deal. On-site service by TRW, however, is optional and costs \$189 a year.

Since the 486SX/20 is upgradable, it is natural to compare this model to a system using the A386 microprocessor from Advanced Micro Devices. You might think there is about a \$1,000 difference between the two, based on the cost of the 486SX/20 processor card, but this is not the case. A comparably equipped 386/40 lists for just \$200 less; hence, the \$4,884 486SX/20 is a more attractive buy. At \$6,284, Hyundai's comparable 486/33 model lists for \$1,400 more.

The Hyundai Corporate Series 486SX/20 will interest those who want a system that can be upgraded and expanded as the need arises. But with below-average performance and a hard disk tucked in a strange place, it makes us advise you to look elsewhere.

IBM CORP. IBM PS/2 Model 90 XP

by John R. Quain



Initially, two things distinguish this machine from the rest of the pack: the Big Blue label and the big price. At \$11,465 with DOS 4.0 and an 8515 monitor, the IBM PS/2 Model 90 XP is the most expensive 20-MHz 486SX PC in our roundup. Even with dealers taking as much as \$1,500 off the system price, only those with limitless resources will feel confident enough to step onto this 32-bit IBM path.

Its Micro Channel architecture (MCA)

COMPUTERS

486SX/20s

bus, upgradable Processor Complex, and cached SCSI adapter mean a premium price. That means plenty of performance potential. Unfortunately, according to PC Magazine Labs' tests, the Model 90 XP's current abilities leave much to be desired.

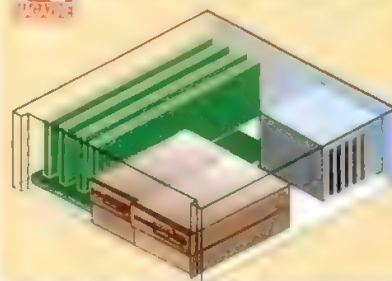
Designed as a desktop workstation, the Model 90 XP has four 32-bit MCA expansion slots, one of which is occupied by the bus-mastering SCSI adapter that comes standard with the system. The motherboard is home only to the basic logic of the system, plus the I/O interfaces and PS/2 mouse and keyboard connectors.

The 486SX processor resides on a proprietary Processor Complex card. The Processor Complex contains all the bus-control logic for the system, allowing for upgrades that cover new bus-control standards—a capability that other upgradable machines lack. The design also offers the possibility of moving to Intel's forthcoming P5 chip.

Performing the upgrade itself is simple; no tools or chip pulling is required. The case has thumbscrews at the rear, and you can pop out and replace the board in one step. Upgrade prices are more difficult to handle: \$2,745 for a 25-MHz 486DX Processor Complex, \$4,445 for the 33-MHz 486DX unit, and \$7,245 for the 50-MHz 486DX. (At press time, IBM had introduced the last option but put it on hold until Intel resolved problems with the microprocessor and resumed shipments.)



FACT FILE



IBM PS/2 Model 90 XP

IBM Corp., 1133 Westchester Ave., White Plains, NY 10604; 800-426-9292.

List price (tested configuration): \$11,465.

Memory and processor RAM cache: 8MB 70-ns. SIMMs.

Disk drives and controller: Western Digital 16-ms. 160MB SCSI hard disk, IBM 512K controller, 1.2MB and 1.44MB floppy disk drives.

Display: IBM XGA 14-inch monitor with 512K RAM.

Monitor refresh rate: 72 Hz.

Software: DOS 4.01, IBM Cache.

CIRCLE 422 ON READER SERVICE CARD

System memory resides on two proprietary cards (64MB maximum). The tested system came with 8MB of 70-nano-second DRAM. Additional memory is expensive: \$565 for 2MB 70-ns. SIMMs. That is more than two and a half times the \$100-per-megabyte price of standard SIMMs.

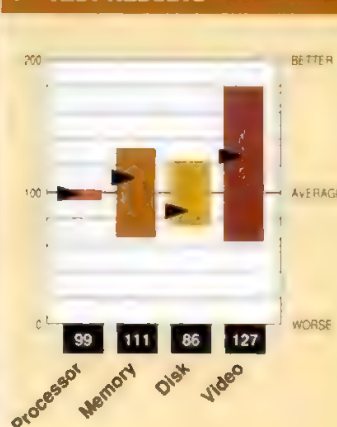
In *PC Magazine's* standard configuration, the Model 90 XP arrived with a 160MB 16-ms. Western Digital WDS-

IBM PS/2 Model 90 XP

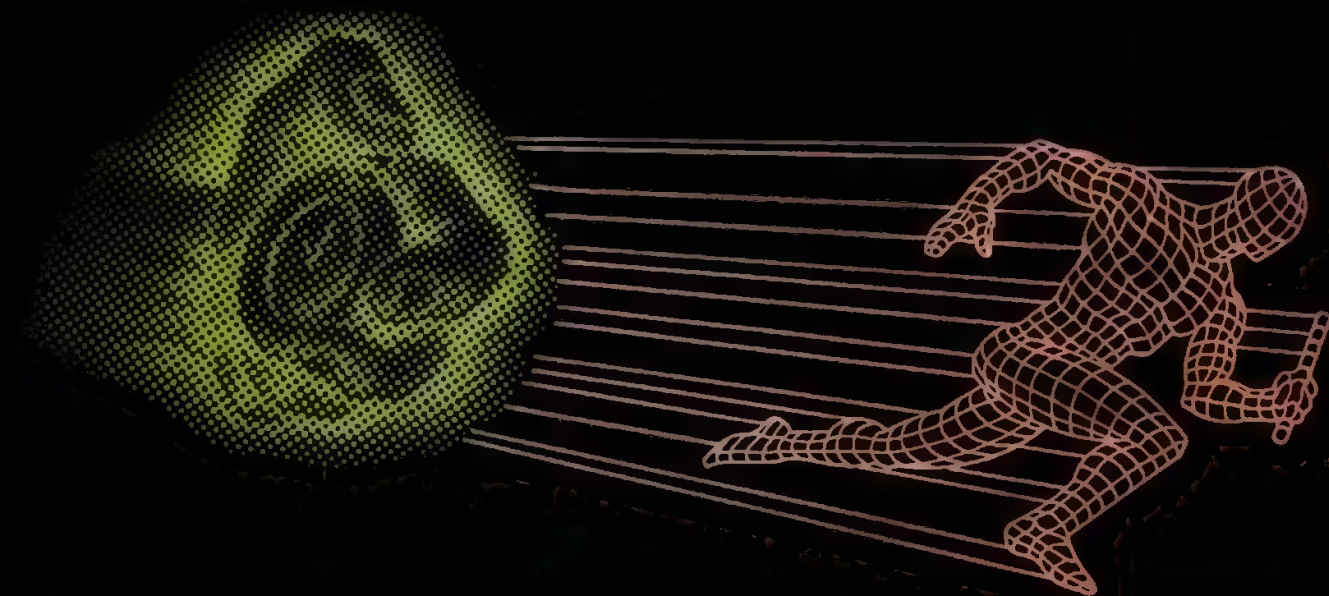


In Short: The IBM PS/2 Model 90 XP is a big step for Big Blue and a major investment for you: It costs \$11,465 for *PC Magazine's* standard configuration, which includes a 512K caching adapter for the SCSI hard disk, a 32-bit MCA bus, and upgradability. Performance, even with the SCSI controller, was below average on several tests, but if future power in a desktop machine is what you want, the price may make sense.

TEST RESULTS



Faster Runtime



Run with ULSI Math Coprocessors

Applications Run Faster

The Math•Co™ 83C87 (DX) and 83S87 (SX) math coprocessors from ULSI Systems are complete double-CMOS, 1-micron technology chips. As a result of this superior architecture, the Math•Co coprocessors can perform floating-point mathematics in fewer clock cycles than needed by the standard Intel 80387.

Keeps on Running—Lifetime Warranty

ULSI Math•Co coprocessors have the industry's best Mean Time Between Failure (MTBF) rating—which is why we're able to offer the industry's only lifetime warranty.

Runs on Everything

Math•Co coprocessors are plug-in compatible with the IBM PC and PC clones. And they're 100% software compatible.

Runs Lean—Low Power Consumption

The Math•Co SX is ideally suited for laptop and portable IBM PC and PC compatible computers. It has a "sleep" mode feature which enables it to draw minimal power while in an idle state.

Operating Speed Availability

DX: 16, 20, 25, 33 and 40MHz
SX: 16, 20 and 25MHz



Instruction	Math•Co	Intel
Add	3	12
MPY	12	17
DIV	40	77
SQRT	37-41	97
RIM	68-72	81

HEADQUARTERS

ULSI Systems, Inc.
58 Daggett Drive
San Jose, CA 95134
Tel: 408-943-0562
Fax: 408-943-0106

NORTH AMERICA SALES & DISTRIBUTION

ULSI Marketing North America
4412 Spicewood Springs Road
Suite 106
Austin, TX 78759
Tel: 512-795-8044
Fax: 512-795-9959

INTERNATIONAL SALES & DISTRIBUTION

ULSI Marketing Europe
The Old Laundry
70 South View Avenue
Caversham, Reading
Berkshire RG4 0HQ
England
Tel: 0734-462297
Fax: 0734-461920

ULSI
SYSTEMS

3160S hard disk, a 1.44MB Alps floppy disk drive, a new Slim High 1.2MB Canon floppy disk drive, and room for one more internal drive. The hard disk is ruled by a 512K caching SCSI controller, which can handle a total of seven devices.

Having the only hardware-caching SCSI controller in this group didn't give the Model 90 XP much of an advantage on PC Labs' tests. Its disk score was in the bottom 25 percent of the machines tested. For optimum performance, according to IBM, the drive system is designed for 32-bit operating systems (like OS/2, Version 2) once they become available.

Though its processor score was not notable, the Model 90 XP did turn in faster-than-average memory performance, and its 1,024-by-768 Extended Graphics Array (XGA) video card came in fifth out of the top five performers. IBM is pushing XGA as the next high-resolution video standard and includes the chip set as standard on the Model 90 XP motherboard. XGA, as it is implemented on the Model 90XP, is interlaced only. The system will recognize a VGA monitor and deliver a noninterlaced 72-Hz Super VGA vertical refresh rate. To get the XGA benefits, however, you will need an 8514/A-compatible monitor, such as the 14-inch 8515 monitor that IBM recommends.

The IBM PS/2 Model 90 XP contains other IBM enhancements, including an improved BIOS with selectable boot drives and password protection. The machine boasts solid construction throughout, but documentation is scant. On less powerful systems, the scarce documentation would be acceptable, but given the possibilities of the Model 90 XP, one expects more. You might also expect more software, and though dealers may bundle software with the system, none is provided standard from IBM. Is this the workstation of the future or just an overpriced 486SX upgradeable? The answer depends on whether you believe in a bus-mastered MCA future—or can afford to find out.

LEADING TECHNOLOGY INC. PC Partner VX

by Gary Berline



Leading Technology (no relation to Leading Edge Products) eyes small-business and home users as the audience for its PC Partner VX. The machine combines an

Leading Technology follows Intel's CPU corner-cutting steps like a good dance partner.

unintimidating look with similarly non-aggressive performance. But its price—which initially appears to be low—needs to drop to reflect the company's cost-cutting measures, as well as indicate the machine's adequate but unspectacular features and performance.

Our \$3,399 test unit met the *PC Magazine* standard configuration (8MB of RAM, a 211MB IDE hard disk, two floppy disk drives, and a Super VGA video subsystem). The price also included a mouse and *Microsoft Windows 3.0*, which are extra-cost options.

The attractive desktop case accommodates one 1.44MB internal device and three half-height front-accessible bays. All machines include *HyperDOS*, a desk accessory handy for the PC tenderfoot who is likely to purchase this package.

Although the PC Partner VX has some advantages over the 386/33—such as faster 32-bit processing—our tests indicate that for current use, the lower-power chip

runs faster. A similarly configured 386/33 even costs \$200 less than the PC Partner VX. In fact, putting the \$599 80487SX into our evaluation system brings the total to \$3,998—only one dollar less than the same bundle with a 486/33.

RAM resides only on a proprietary 32-bit board that holds a maximum of 12MB in 2MB SIMMs. A jack-of-all-trades card that controls two floppy disk drives and all ports also holds the IDE adapter.

The video adapter occupies another slot, leaving room for one 8-bit and four 16-bit cards. Our 1MB Tseng-based Super VGA adapter flew through the video test, garnering fourth place. A 15-millisecond Seagate drive turned in an average time, and with a software cache, its performance improved about as much as its peers' performance did.

Leading Technology follows Intel's CPU corner-cutting steps like a good dance partner—a reasonable choice for a machine aimed at price-conscious but not power-hungry users. Memory and processing test results were slightly below average, probably due to the system's 80-ns. SIMMs, its page-mode addressing, and the lack of an external cache. The lack of a separate socket for a math chip prevents you from using a Weitek, but you can still use an 80487SX, which simply replaces the CPU. If you think you will ever need a coprocessor, buy a 486DX system.

Some corners get shaved too close. The keyboard cable, which connects to

Leading Technology PC Partner VX

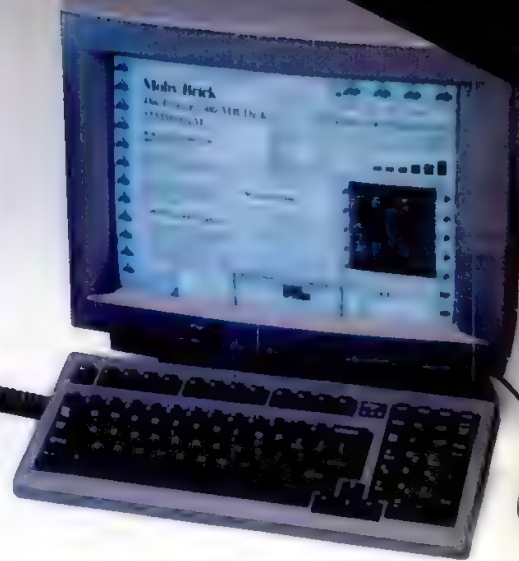
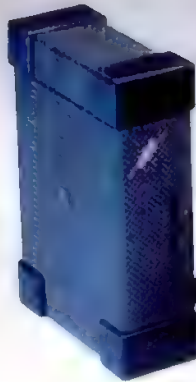


In Short: An average performer in most areas, the PC Partner VX has more emphasis placed on its outward appearance than on its performance. Leading Technology targets the machine for home and small-business users. The company follows Intel's 486SX cost-cutting lead, but it fails to reflect that company's savings adequately in the sticker price.



MOBY BRICK™

**33MHz 486, 510MB Hard Disk,
32MB RAM, 1024 x 768 VGA, only 8.7 lbs.**



If your PC has become too indispensable to leave behind, yet your performance demands are beyond the capabilities of today's notebooks, then Moby Brick is your answer. It offers the fastest 486-33 performance available, enormous storage capacity, and exceptional graphics in a delightfully quiet, stylish design. There is simply not a faster or nicer desktop PC available.

This claim is supported by worldwide editorial praise and prestigious awards and includes IDSA's Best

Product Design of the Year.

The Virtue of Versatility

Unlike traditional desktops, which limit you to a single location, you can use Moby Brick with its blazing performance and all your data away from your desk. For computing between regular locations, such as home and office, simply keep a keyboard, power supply and monitor at each site and carry just the Moby Brick module in-between.

The Awesome Roadwarrior

For travel, add the companion LCD panel and Moby Brick is

transformed into the most powerful, portable system available. The 10.4" edge-lit

640 x 480 VGA LCD panel offers clear, bright images with 64 gray scale levels.

All the Good Stuff

Moby Bricks are available with either 20MHz 486SX or 33MHz 486DX processors and 4, 8, 16 or 32MB RAM. (386SX based Bricks are also available.) All Bricks feature reliable IDE Conner hard disks including 44MB (28ms), 120MB (19ms), 212MB (15ms), or 510MB (13ms) combined

with a unique BIOS integrated disk cache (8MB max.) to provide the highest performance. The built-in 16-bit Super VGA graphics offers up to 1024 x 768 non-interlaced resolution with 1MB video RAM. Other standard features include a 2,400bps modem, 3.5" 1.44MB floppy, and an ISA 16-bit internal half length exp. slot.

Bricks are 100% IBM AT-compatible and support DOS, OS/2, UNIX, QNX, X/Windows and Novell.

Snappy Connections and Expandability

The optional Docking Terminal provides instant



hook-up of all cables as well as a second, 16-bit 3/4 length expansion slot. The rugged aluminum case with shock-absorbing rubber corners is available in granite or beige finish along with color coordinated keyboards, mice and monitors.

Factory Direct Value

Bricks are available directly from Ergo—the same people who design, manufacture and support them. However, a good deal is only one of the reasons you'll enjoy doing business with Ergo. We offer unlimited, toll-free technical phone support, overnight repair service, a one-year warranty and a no

nonsense, 30-day satisfaction guarantee.

\$4,995

486DX MOBY BRICK
33MHz Intel 486DX
4MB RAM exp. to 32MB
120MB 19ms cached hard disk

486SX MOBYBRICK
4MB, 120MB HDD **\$3,995**

386SX-16MHz BRICK
2MB, 44MB HDD **\$1,795**

Standard Features

1024 x 768 Super VGA adapter
1MB video RAM, supports
VGA, EGA, CGA, MDA
2,400bps modem
2 serial, 1 parallel port
Ergo BIOS
Password Protection
3.5" 1.44MB Teac floppy
One 16-bit half length int. exp. slot
World Wide AC power supply
DOS 5.0, Windows 3.0, Adobe
ATM, Mouse **OR** DESQview/386,
QEMM 6.0, Tree86



Options

212MB 16ms hard disk	add \$600
510MB 13ms hard disk	add \$1,500
Additional RAM per MB	\$100
Docking Terminal w/16-bit slot	\$395
VGA LCD module	\$995
250MB tape backup	\$645
101 keyboard (beige or grey)	\$109
Padded Cordura Brick Bag	\$99
14" 1024 x 768 VGA monitor (beige)	\$495
15" 1280 x 1024 VGA monitor (grey)	\$895
17" 1280 x 1024 VGA monitor (shown)	\$1,395

TO ORDER, CALL
1-800-633-1925

Or to receive information
via FAX, 24 hrs.

1-800-THE-BRICK
CIRCLE 479 ON READER SERVICE CARD



33-1-47917100



41-216911066



44-602-452226



49-8142-50031



61-2-9068900



47-2-327700



82-27264360



81-33572-3204



Invest in something with growth potential.

America's economic future depends on a motivated, educated work force. At a Boys & Girls Club, kids learn the life skills and job skills they need to grow into productive members of our American economy, as well as our society.

Please make a contribution to the Boys and Girls Clubs. You'll be investing in the growth of America.



BOYS & GIRLS CLUB

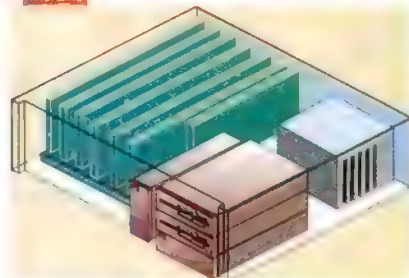
SUPPORT THE CLUB THAT BEATS THE STREETS

COMPUTERS

486SX/20



FACT FILE



PC Partner VX

Leading Technology Inc., 10430 SW Fifth St., Beaverton, OR 97005-3447; 800-999-5323, 503-646-3424.

List price (tested configuration): \$3,399.

Memory and processor RAM cache: 8MB 80-ns. SIMMs.

Disk drives and controller: Seagate 15-ms. 211MB IDE hard disk, 1.2MB and 1.44MB floppy disk drives.

Display: Focus Super VGA adapter with 1MB RAM, Samsung 14-inch monitor.

Monitor refresh rate: 56 Hz.

Software: DOS 4.01.

CIRCLE 423 ON READER SERVICE CARD

the back, barely reaches the front. An inadequate 56-Hz refresh rate at 800-by-600 resolution can make prolonged viewing of the PC Partner 1420S monitor (actually a Samsung product) somewhat straining. The evaluation system's motherboard flexed considerably, due to a missing standoff that supports the motherboard—not a usual occurrence, according to company officials.

Leading Technology offers a \$2,799 basic system with 4MB of RAM, a 106MB IDE hard disk, and a monitor with a 0.41-millimeter dot pitch (versus the 0.28-mm. pitch of the tested monitor), but this does not include *Windows* or a mouse. The vendor's attractive support policy includes one year of on-site service from GE Computer Services to registered users, and lifetime toll-free phone support.

The company chooses many spots to clip features—some important and some not so important. The cost cutting, however, seems to lose something in the translation to sales price. The PC Partner VX retails through superstores and VARs (value-added resellers), but even with the probable discount, too many other systems offer better performance and features for similar dollars. Leading Technology needs to apply its corner-cutting razor to its own price list.



Introducing the first notebook computer designed to make Windows™ a breeze.

Just turn it on and go. It's that simple. The new TI TravelMate™ 3000 WinSX™ package is engineered to meet the challenges of running Windows on a notebook computer. That's why it comes with MS-Windows® 3.0 and MS-DOS® 5.0 already installed on the 60MB hard drive. So within seconds, you're into Windows and ready to load your application software.

But the TM3000 WinSX offers so much

more. Like clicking in and out of applications with a specially designed pointing device. An extra-large, easy-to-see cursor that keeps your place as you move from screen to screen.

And Battery Pro™. Designed to extend battery life when working in Windows, it suspends functions you're not using while keeping calendars and other background programs current. So you can pick up

where you left off.

Best of all, these Windows features, and more yet, come in the industry's smallest, thinnest and lightest 386SX™ 20 MHz notebook computer.

Finding out more is a breeze, too. For the name of a dealer near you, call 1-800-527-3500.

 **TEXAS
INSTRUMENTS**

MS-Windows and MS-DOS are registered trademarks and Windows is a trademark of Microsoft Corporation. TravelMate, WinSX and Battery Pro are trademarks of Texas Instruments Incorporated. 386SX is a trademark of the Intel Corporation.

© 1991 TI 71853

CIRCLE 304 ON READER SERVICE CARD

NOVACOR INC.

Novas 486SX-20

by John R. Quain

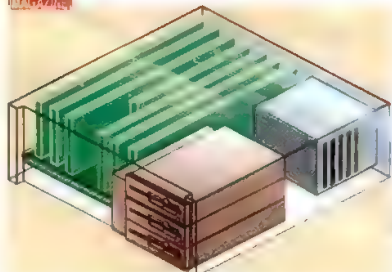


If 486SX-based machines are ever going to lure buyers away from mainstream 386 PCs, they will have to compete with rapidly dropping 386 prices. This is exactly what Novacor is aiming to do with its Novas 486SX-20. The system is not upgradable or housed in a giant tower case, and it doesn't come with *Microsoft Windows 3.0* or a mouse or blow the disk drives off the competition. But it is inexpensive: \$2,324. Though Novacor's systems are sold mainly through dealers, don't expect many discounts below Novacor's already rock-bottom price.

Intended as an entry-level 486 PC, the OPTi chip set-based ISA Novas 486SX-20 comes in a 7.9- by 14.8- by 16.3-inch baby case with all drive bays accessible from the front (three standard half-height drives and one vertical 3.5-inch bay). Of its seven 16-bit slots and one 8-bit slot, five are free for expansion cards. In *PC Magazine's* standard configuration, the system came with a 16-millisecond 212MB Conner IDE hard disk, 8MB of 80-nanosecond DRAM (32MB installable on the motherboard), 64K of 20-ns. SRAM external memory cache (expandable to 256K for \$150), and DOS 5.0. The ports—one parallel, two serial, and one game port—required an I/O card.

COMPUTERS 486SX/20

PC FACT FILE



Novas 486SX-20

Novacor Inc., 1841 Zanker Rd., San Jose, CA 95112; 800-486-6682, 408-441-6500.

List price (tested configuration): \$2,324.

Memory and processor RAM cache: 8MB 80-ns. SIMMs, 64K cache.

Disk drives and controller: Conner 16-ms. 212MB IDE hard disk, 1.2MB and 1.44MB floppy disk drives.

Display: Tseng 1,024-by-768 adapter with 512K RAM, Helm Engineering 14-inch monitor.

Monitor refresh rate: 72 Hz.

Software: DOS 5.0, SMARTDRV.SYS.

CIRCLE 484 ON READER SERVICE CARD

The 486SX-20's video capabilities are based on a Tseng 16-bit card that uses Tseng's own popular ET4000 Super VGA controller. With only 512K of video memory, the adapter is capable of displaying a 1,024- by 768-pixel noninterlaced image in 16 colors. It can achieve a 72-Hz vertical refresh rate in Super VGA

FREE MODEM

If you call now, you'll get a free 2400 Baud Modem with any desktop system. And it includes the features, performance, better service and lower prices you've come to expect from Standard.



- ▼ 4MB of RAM expandable to 64MB on-board.
- ▼ 64KB of cache, expandable to 256KB.
- ▼ 1024 X 768 SVGA with 1MB RAM.
- ▼ 14" Non-interlaced SVGA color monitor.
- ▼ < 15ms IDE Hard Drive.
- ▼ -386/33: 130MB with 64KB cache buffer.
- ▼ -486/33: 210MB with 32KB cache buffer.
- ▼ 1.44MB 3.5" and 1.2MB 5.25" genuine TEAC floppy drives.
- ▼ 1 parallel, 2 serial, and 1 game port.
- ▼ High resolution mouse.
- ▼ MS-DOS 5.0 and Microsoft Windows 3.0.
- ▼ FREE! 2400 Baud Internal Modem.

386+33 \$ 1995

486+33 \$ 2695

We set the standard.

- ▼ 2 year parts and labor warranty
- ▼ 1 year TRW on-site service*
- ▼ 30-day money back guarantee
- ▼ Lifetime toll-free tech support
- ▼ Express parts replacement
- ▼ No surcharge for credit cards
- ▼ Company P.O.s accepted
- ▼ Leasing program available
- ▼ APO/FPO orders welcome
- ▼ NetWare Engineers on staff

STANDARD

COMPUTER

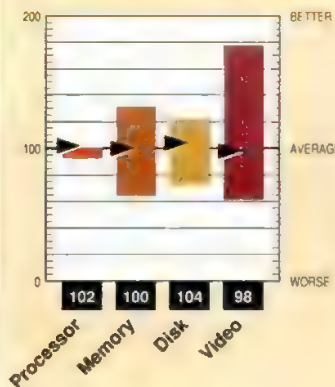
12803 Schabarum Avenue, Irwindale, CA 91706
Phone: 818-337-7711 Fax: 818-960-2926
Hours: M-F 7am - 6pm, Sat. 10am - 3pm

Novas 486SX-20



In Short: The Novas 486SX-20 is an entry-level 486 machine with average abilities. It is priced accordingly, at \$2,324. Though its Conner IDE hard disk was slower than most, DOS 5.0's SMARTdrive disk-caching software brought it up to speed. The Novas's baby case means you give up some expandability, but you will still benefit if a low price is what you seek.

TEST RESULTS



FREE POWER WINDOWS

WHY SETTLE FOR A CONVENTIONAL SYSTEM WHEN YOU CAN GET A TRUE WINDOWS WORKSTATION FOR THE SAME PRICE?

FOR ABOUT \$3200, YOU CAN BUY A CONVENTIONAL 386/33 SYSTEM - OR OUR 386/33 WINDOWS WORKSTATION.

	Standard 386/33	Dell 333D	Zeos 386/33	Northgate 386/33 Elegance SP
Video System	Windows Graphics Accelerator 1MB VRAM and 512K DRAM	Basic SVGA 1MB DRAM	Basic SVGA 1MB DRAM	Basic SVGA 1MB DRAM
Monitor	15" Flat Screen	14"	14"	14"
HDD	210 MB (w/accelerator)	80MB	210MB	106MB
Memory	8MB	2MB	8MB	4MB
FAX Modem	Yes	No	No	No
Price	\$3195	\$3799	\$3295	\$3399

Introducing Power Windows from Standard Computer.

For what you'd pay for a conventional 386/33, now you can own one of the new 386/33 Windows Workstations from Standard Computer. It's the first and only complete hardware solution for Windows users. We give you a lot more of what you really need. More Video. More Memory. More Monitor. More Workstation. More of what you really need to make Windows really run. Without having to pay a penny more.

We just broke the speed limit.

**SPEED LIMIT
24X**

Our new Windows Workstations combine a 15" color monitor, Windows accelerator card and superior disk cache software for blazing speed. Just how fast? How about video speed 24x faster than SVGA and 2-5x faster than most other co-processed video cards available today.

One board is worth a thousand pictures.

The award-winning ATI Graphics Ultra windows accelerator SVGA card packs 1MB of Dual ported VRAM and 512K of DRAM. What that all adds up to is an eye opening 1024 x 768 resolution in 256 colors and a 72 Hz refresh rate in all modes.



WINDOWS WORKSTATIONS

- ▼ ATI Graphics Ultra CO-PROCESSED SVGA card with 1 MB VRAM and 512 KB DRAM. 72 Hz screen refresh rate. Mouse port and mouse included.
- ▼ 15" FLAT SCREEN MAG Colorview monitor.
- ▼ 8 MB of RAM (386 Expandable to 32MB; 486 Expandable to 64MB on board).
- ▼ 64KB of cache memory expandable to 256KB.
- ▼ 210MB < 15ms IDE Hard Drive with 32KB cache buffer.
- ▼ TEAC 1.44MB 3.5" & 1.2MB 5.25" floppy drives.
- ▼ 2 serial, one parallel, and one game port.
- ▼ 130 Key programmable keyboard.
- ▼ Vertical case with 8 drive bays (6 external).
- ▼ Desktop model available.
- ▼ Hyper Disk hard drive caching software.
- ▼ MS-DOS 5.0 & Microsoft Windows 3.0.
- ▼ Two year Parts and Labor Warranty with TRW first year on-site service.
- ▼ FREE! 9600 Baud Fax/2400 Baud Modem with Window's Faxit Software.

Looks are Everything.

The Mag Colorview 15" flatscreen monitor provides a full 100% edge to edge viewing area. And the 72Hz refresh rate provides absolutely flicker-free performance. It's this kind of performance that has earned the Mag Colorview/15 monitor PC Magazine's coveted Editors' Choice Award.



Better built. Better Backed.

If you've been looking for a Windows Workstation, look no further. Standard Computer has the best prices on the best systems anywhere. And with a two year full parts and labor warranty, one year TRW on-site service and lifetime toll-free tech support - compared to the other guys - it's just like getting Power Windows free.

1-800/662-6111



STANDARD

C O M P U T E R

We Set the Standard.

CIRCLE 163 ON READER SERVICE CARD

Proof You Gain Weight



*Weight, which includes battery, varies with hard disk size. Suggested retail prices subject to change without notice. © 1991 Everex Systems, Inc. All rights reserved. EVER for EXcellence is a registered trademark, and Everex and Tempo are trademarks of Everex Systems, Inc. KeyMouse is a trademark of KeyTronics, Inc. (Technology licensed from Home Row Inc.) The Intel Inside logo is a trademark of Intel Corporation. Other company and product names are the registered trademarks of their respective holders.

Don't Have To To Add Muscle.

TEMPO

INTRODUCING THE LIGHTWEIGHT, HIGH PERFORMANCE TEMPO CARRIER.

It weighs in at less than five and a half pounds. Yet, when it comes to performance, the Tempo™ Carrier™ Notebook from Everex™ is anything but a lightweight.

Like its predecessor — our critically-acclaimed Tempo LX — the Tempo Carrier offers a collection of features you won't find in any other comparably-priced notebook.

For starters, it's powered by a serious 20MHz i386SX™ processor. And with up to 8MB of RAM and your choice of a 40MB or 80MB internal hard drive, the Tempo Carrier delivers more muscle than some of the mightiest desktop PCs.

All of which means it's strong enough to run through all your Windows, OS/2 or DOS applications from just about anywhere you happen to be working. Because, as one of the smallest high performance notebooks ever created, the Tempo Carrier fits into a space half the size of this ad.

But building a smaller footprint wasn't our only objective.

In fact, the Tempo Carrier is the world's first notebook to integrate the amazing new KeyMouse™. This keyboard-controlled pointing device completely eliminates the need for an external mouse or trackball. (If you've tried to use a mouse on an airplane, you know the advantages of that.)

However, if you still prefer to use a traditional mouse, the Tempo Carrier



Eliminating the weight, bulk and hassle of an external mouse or trackball, the unique KeyMouse uses the pressure-sensitive "J" key to control your cursor movement in any direction.



The Tempo Carrier

- Intel® 80386SX 20MHz CPU
- 5.2 Lbs (Including Battery)*
- VGA Backlit Display
- Multi-Level Power Mgmt. System
- 1.5-Hour Quick Charge
- 80-Key Keyboard with "KeyMouse"
- 2MB RAM (Expandable to 8MB)
- 40MB or 80MB Internal Hard Drive
- 1.44MB 3.5" Internal Disk Drive
- 80387SX Math Coprocessor Socket



The Tempo LX

- Intel 80386SX 20MHz CPU
- 7.1 Lbs (Including Battery)*
- VGA Backlit Display
- 2-3 Hours Battery Life
- Power Mgmt. System
- 1-Hour Quick Charge
- Full Travel 82-Key Keyboard
- 1MB RAM (Expandable to 5MB)
- 20MB, 40MB or 60MB Internal Hard Drive
- 1.44MB 3.5" Internal Disk Drive
- 80387SX Math Coprocessor Socket

includes a free MS-compatible mouse. We've also included two serial ports — so you'll still have an additional port free for an external modem, a portable numeric keypad or another serial device — as well as a parallel port, keyboard port and external VGA monitor port for total flexibility.

Speaking of monitors, the Tempo Carrier offers one of the brightest VGA screens in the industry. Our high speed 640 × 480 LCD delivers clear, backlit resolution and 32 shades of grey to help you create desktop-quality spreadsheets and graphics.

And to ensure that you work as productively as possible, our Multi-level Power Management System controls power to the display, hard disk and serial ports for the most efficient use of battery charge. It also provides battery saving Suspend/Resume and SmartSleep

FOR ADDITIONAL INFORMATION CALL:

1-800-437-EVER

In Canada (1-800-663-5161)
Outside North America (510-498-1111).



capabilities, as well as password-only access for reliable data security. It even allows you to set "hands free" operation by scheduling precise power-up times or enabling in-

coming modem calls to activate the system.

Considering all the features of the Tempo Carrier, it's hard to believe we loaded so much into such a lightweight package. Even when you combine the system, battery, AC adaptor and power cord into your free padded carrying case, you'll still have a total weight of just 8.2 pounds!

Perhaps the only thing more impressive than how light we kept the weight is how lean we kept the price. In fact, the Tempo Carrier even keeps your budget in shape.

FREE WITH YOUR PURCHASE:

MS-Windows 3.0	\$145 Value
MS-DOS 5.0	\$130 Value
MS-compatible Mouse	\$79 Value
Carrying Case	\$69 Value

Total Value of \$423

Limited offer through January 31, 1992

One year parts & labor warranty (includes 48-hour turn around and free overnight pick-up and delivery within the Continental U.S. only)

ENTRE
COMPUTER CENTER™

TCBC

Connecting Point **III**
COMPUTER CENTERS

CompuCom Systems

Intelligent Electronics

So if you're looking for the best value in high performance notebooks, call us for more information about the new Tempo Carrier and the Tempo LX or the location of the Tempo reseller nearest you. Because picking up the Tempo has never been easier.

EVEREX
EVER for EXcellence

Upgrade Today...

SX/Now!™ PROCESSOR UPGRADES

286 to 386SX Processor Upgrades

- ◆ Onboard Cache Memory & High Speed Clock (20 or 25 MHz)
- ◆ Requires NO Expansion Slot
- ◆ 80387SX Co-Processor Socket
- ◆ **NOW** available for:
 - ◆ IBM-AT, AST Premium 286, AST Bravo 286, HP ES286/12
 - ◆ PS/2 25/286, 30/286, 50, 50z, 60

"Kingston Technology Corp.'s SX-Now! is the undisputed performance champ"

PC MAGAZINE OCTOBER 29, 1991

FREE!
Guide to Upgrading
Your IBM 286 PC
To A 386SX
Cost Effectively
CALL TODAY!

MEMORY UPGRADES

Memory for: IBM, Compaq, Toshiba, Apple, HP, AST, Dell, DEC, Epson, NEC, SUN, Zenith, AT&T, Sharp, NCR, Silicon Graphics, Everex, TI and other CPU's & Printers.

DRIVE UPGRADES

Drive upgrades for: PS/2's, Compaq's, AT's, SUN, DEC, IBM RISC, Macintosh, plus SCSI Adapters and Drives.

What makes Sigma Data your best source for **Kingston** TECHNOLOGY CORPORATION products?

- ◆ Knowledgeable Sales & Support
- ◆ 5-Year Warranty
- ◆ Immediate Shipping
- ◆ 30-Day Money-Back Guarantee

ΣSigma Data

P.O. Box 1790, New London, NH 03257 ♦ NH (603)526-6909 ♦ Fax: (603)526-6915

VISA, MC, AMEX, COD & Qualified PO's accepted. All brands and trademarks are the property of their respective holders.

1-800-446-4525

Profit from over 10 years of experience

Standard Computer Corp. configures its 486SX/20 Windows Workstation with a coprocessed video adapter and a top-rated monitor.

mode, but the low-end 14-inch Impression monitor from Helm Engineering supplied with the system failed to impress us; it cannot match the adapter's 1,024-by-768 resolution. Novacor does offer other monitor options, including a 16-inch Nanao 9070U for \$995, that can match the Tseng adapter's capabilities.

The 486SX-20's performance was about average for a PC in this class. Its video score was a little below average, and its processor time was a little above the norm. The 486SX-20 turned in an average score for the memory test.

The one unusual element of this Novacor system is its versatile Mr. BIOS software. Through setup, it allows the user to enable several unusual options, including an antivirus setting that prevents writes to the hard disk's boot sector. Additional BIOS menu settings let you change the read or write DRAM wait states, the DMA allocation, the video and system shadowing, and the cache arrangement, and a keyboard utility allows you to resolve conflicts between a NetWare LAN and the keyboard.

For a machine aimed at new 486 users, the scant documentation Novacor supplies will leave most beginners floundering. The technical manual for the system board includes the primary instructions for the PC; Novacor said that the finished manual, which it is publishing in Taiwan, would ship with the 486SX by year's end.

For users who still have difficulty with their 486SX-20, Novacor covers its equipment with a one-year parts-and-labor warranty and 8:30-to-5:30 (P.S.T.) toll-free technical assistance. To make the company's low-cost 486 argument more forceful, Novacor sells a low-end 486SX system with all the same features, minus

Microsoft makes sure you fly realistically. It's up to you to fly responsibly.



So you get an urge to buzz the Golden Gate Bridge. Okay. You can ignore the FAA—but not the crosswinds. Because in the world of Microsoft® Flight Simulator® 4.0, everything that happens is true to life.

Banking, climbing or dodging thunderheads, your plane responds with perfect realism to your every move. Plus, you have 100,000,000 square miles of land to fly over. And four planes to choose from: a Cessna, a Lear Jet, a sailplane, or a dogfighter's dream—the Sopwith Camel.

Ask your Microsoft dealer about PC Flight Simulator.

Take it into the air. And find out what they really mean by "the wild blue yonder."

Microsoft

© 1991 Microsoft Corporation. All rights reserved. Printed in the U.S.A. Inside the 50 United States, call (800) 541-1361. Dept. 779, outside the 50 United States, call (206) 535-8661. Customers in Canada, call (416) 568-3503. Microsoft and the Microsoft logo are registered trademarks of Microsoft Corporation. Flight Simulator is a registered trademark of Sierra Software.

4MB of RAM and 256K of video RAM, and with a smaller 40MB hard disk, for just \$1,655. You may sacrifice some expandability and have to settle for a system design that is not as fancy as others in this roundup, but if a low-cost 486 is what you desire, the Novas 486SX-20 will appeal to your frugal nature.

STANDARD COMPUTER CORP. Standard 486SX/20 Windows Workstation

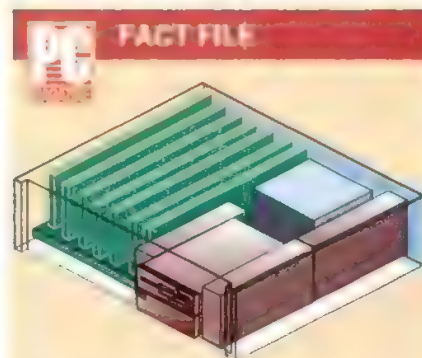
by Bruce Brown



Don't buy the Standard 486SX/20 Windows Workstation for its processor; buy it for its hot video setup. Standard Computer Corp. configured this system with the well-regarded ATI video coprocessor and video adapter components, along with an equally top-rated MAG Computronic Colorview/15 monitor. For Microsoft Windows applications, you need all the video speed you can get, and this system is designed for that need.

The standard-configuration price is an attractive \$3,245 and includes great video

components in addition to the more typical 8MB of RAM, 210MB 15-millisecond Quantum IDE hard disk, both floppy



Standard 486SX/20 Windows Workstation
Standard Computer Corp., 12803 Schabarum Ave., Irwindale, CA 91706; 800-662-6111, 818-337-7711.
List price (tested configuration): \$3,245.
Memory and processor RAM cache: 8MB 80-ns. SIMMs, 64K cache.
Disk drives and controller: Quantum 15-ms. 210MB IDE hard disk, 64K buffered cache, 1.2MB and 1.44MB floppy disk drives.
Display: ATI 1,024-by-768 adapter with 1MB VRAM and 512K DRAM, MAG Computronic 15-inch monitor.
Monitor refresh rate: 72 Hz.
Software: DOS 5.0, Microsoft Windows 3.0, HyperDisk.

CIRCLE 488 ON READER SERVICE CARD

You must have heard how **SOUND BLASTER** took the PC market by storm...

Now the **HURRICANE...**

SOUND BLASTER

Stereo/Music/Voice/Speech/MIDI/CD-ROM Interface/Game Port

The Multimedia Sound Standard

PRO



"It's the next-generation sound card and it is loaded! The operative word is "twice." It has twice the sound channels (22) of the original Sound Blaster with twice the quality of sound in stereo, as well as stereo DACs for digitized speech and sound effects."
Computer Gaming World
August 1991



"With its associated software, it has quietly (no pun intended, but what the heck) become the standard sound system for advanced PCs."
Jerry Pournelle, BYTE June 1991

COMPUTE August 1991

"...Creative Labs is now turning up the volume with the Sound Blaster Pro. It's basically two Sound Blasters on a single card with additional multimedia features thrown in. It has twin FM chips capable of creating 22 individual voices, two DACs for stereo voice and sound-effects playback, a stereo microphone jack, and a built-in stereo mixer that can adjust the volume of all your Sound Blaster audio sources (stereo DAC, stereo FM, microphone, stereo line-in, CD-Audio and PC internal speaker).

The built-in mixer makes the Sound Blaster Pro fully compliant with Microsoft's Multimedia Level 1 Extensions to Windows. Multimedia software will be able to fade-in, fade-out and pan the various audio sources to create elaborate sound montages.

The Sound Blaster Pro includes a CD-ROM interface for either an internal or external CD-ROM player. There's also an internal connector for CD-Audio. The MIDI interface is compatible with the original Sound Blaster's MIDI interface but adds the MIDI time-stamp that's part of Microsoft's new multimedia standard.

All in all, the Sound Blaster Pro is chock-full of new features, yet it's fully compatible with its younger brother."

Reprinted by permission of COMPUTE ©1991, COMPUTE Publications International Ltd

At a **devastating price of \$299.95** and you get a "chock-full of features":

- * Stereo DAC for digitized sound output
- * Stereo voice recording from mic, CD or Line-in
- * Sampling rate 4KHz to 44KHz
- * Stereo 22-voice FM music synthesizer
- * Stereo mixer with digital volume controls
- * MIDI interface with adaptor and cables
- * Built-in CD-ROM interface
- * Joystick Port
- * Microphone AGC amplifier
- * Power amplifier (4W per channel)
- and loads of **FREE** bundled software:
 - * MIDI Sequencer
 - * Pro-Intelligent Organ
 - * VEDIT2 - Voice Editor & Utilities
 - * SBTALKER - text-to-speech synthesizer with DR SBAITSO2
 - * Talking Parrot - voice in/out application
 - * MMPLAY Multimedia Presentation
 - * CD music player
 - * Windows 3.0 DLL and sound applications



"The big question is, at a list price of \$249.95, is the Sound Blaster worth the investment? Yes, yes, a thousand times yes!!!" **PC HOME JOURNAL**

How many "yes!!!" would you give now that the Sound Blaster list price is reduced to **\$169.95!** And you get:

- * DAC for digitized voice output
- * ADC for voice recording
- * 11-voice Ad Lib FM synthesizer
- * Full duplex MIDI interface
- * Joystick Port
- * Microphone amplifier
- * Power amplifier (4W per channel)
- * Bundled software: • Intelligent Organ
- Talking Parrot • Voice Toolkit
- SBTALKER • DR SBAITSO
- Jukebox for Windows 3.0

Sound Blaster Micro Channel Version is also available.

North America master distributor:
Brown-Wagh Publishing
130D Knowles Drive Los Gatos CA 95030
For your nearest dealer, call 1-800-451 0900
Tel (408) 378 3838 Fax (408) 378 3577

CREATIVE LABS, INC.

2050 Duane Avenue Santa Clara CA 95054
Tel (408) 986 1461 Fax (408) 986 1777

Outside North America, contact:

CREATIVE TECHNOLOGY PTE. LTD.

75 Ayer Rajah Crescent #02-04 Singapore 0513
Tel (65) 773 0233 Fax (65) 773 0353

Microsoft and Windows are registered trademarks of Microsoft Corp and Ad Lib is a registered trademark of Ad Lib Inc. Sound Blaster is a trademark of Creative Labs, Inc.

THE PC SOUND STANDARD

Largest support of **Multimedia, Music, Education, Entertainment & Productivity software under DOS and Windows 3.0.**
CIRCLE 541 ON READER SERVICE CARD

disk drives, and DOS 5.0. This price also includes *Microsoft Windows 3.0*, disk-caching software, *HyperDisk 4.21*, and a mouse. The tested system had the usual 101-key keyboard, but the company now ships Focus 130-key units with all Windows Workstation computers.

Another plus: At no extra cost, Standard now bundles the Complete Modem Plus (from The Complete PC)—a 2,400-bps modem with a 9,600-bps send/receive fax capability. The package includes Bit Software's *Bitcom* and *BitFax* programs (both DOS products) and Alien Computing's *Fax-It* (Windows fax software).

Since this system is not upgradable, you have to make your choices before you start. Odds are that both the lower-performance and high-end configurations will sell more than the 486SX/20-based system. A similarly equipped unit with a 386/33 processor is priced at \$3,045, while a 486/33 computer with the same components is just \$3,445. All of Standard's systems ship with the ATI Graphics Ultra card.

The Windows Workstation's video system consists of an impressive card-and-monitor combination. The ATI card's video coprocessor works in 1,024-by-768 noninterlaced and also in Super VGA (800-by-600) mode; the video adapter supports video modes up to 1,024-by-768 noninterlaced. This card is very fast at processing graphics and includes hard-

How to land a 747 in an area no bigger than your desk.



What do you need to bring in a 400-ton, five-story jetliner? Nerves. Skill. And the Microsoft® Flight Simulator® Aircraft & Scenery Designer.

Add it to our Flight Simulator 4.0, and you're off on the most realistic flight

experience this side of a PC. You get a Boeing 747-400, complete with computerized flight display. You can also try out a Piper Archer, a Beechcraft Starship or a seaplane. Fly them stock, or push the envelope and modify them to your own specs.

See a Microsoft dealer. Because now it's possible to buy excitement. In the jumbo size.

Microsoft

© 1991 Microsoft Corporation. All rights reserved. Printed in the U.S.A. Inside the 50 United States, call (800) 541-1261, Dept. T79; outside the 50 United States, call (206) 936-8861. Customers in Canada, call (416) 568-3503. Microsoft and the Microsoft logo are registered trademarks of Microsoft Corporation. Flight Simulator is a registered trademark of Bruce Artwick.

ware-based anti-aliasing. The system's special video graphics speed, however, is not reflected in our text mode-based video test. Since our video test is not designed to test this capacity, the unit's video score appears average.

Usually video adapters and video

coprocessors come on separate cards, using an extra slot and restricting communication between them to the speed of the I/O bus; having both on one card is a decided advantage. The card has 1MB of VRAM for the coprocessor, 512K of DRAM, and a mouse port. The Colorview /15 monitor has a slew of preconfigured settings, is programmable to 1,280-by-1,024 resolution, has a 15-inch-diagonal exposed viewing area, and can autosize to use the full screen in all modes.

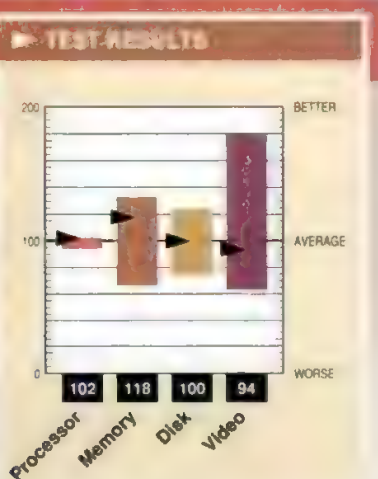
The small-footprint case has two front-accessible 5.25-inch half-height drive bays, one front-accessible 3.5-inch bay, and space for two internal 1.44MB drives. Eight 16-bit ISA slots, with two occupied by video and I/O cards in our tested unit, left six slots free. A tower case with six drive bays, however, costs \$150 more.

The VEGA motherboard uses a Symphony Labs chip set for processor support and to control the external RAM cache. The test machine had 64K of 25-nano-second external write-through cache, expandable to 256K. Motherboard memory expands to a 64MB maximum using interleaved page-mode SIMMs. Although the test system came with 80-ns. SIMMs, Standard now ships 70-ns. modules exclusively.

Standard 486SX/20 Windows Workstation



In Short: Though video scores appear average, our text-based benchmark tests don't measure the fine graphics performance of the Standard 486SX/20 Windows Workstation's hot video setup—a coprocessed ATI Ultra card with 1MB of VRAM and 512K of DRAM. Nevertheless, this small-footprint system, which costs \$3,295 in *PC Magazine's* standard configuration, combines good expansion, solid construction, and a fine service-and-support policy.



A FAX MODEM SHOULD FAX.....

9600 SEND/RECEIVE FAX

Now that a single card puts a full-featured fax machine and data modem in a PC, fax modems are on everybody's buy or wish list. But they're not all alike! Cardinal's MB2296SR offers up to twice the speed of most others in its class. And our unique FLASHlink™ with MNP™ 5 accelerator software can save you time and costly phone charges.

FAST FAX

Send and receive from your PC to virtually any fax machine at full 9600 fax speeds. At a price lower than many plain modems! Some others only send/receive at half that speed, which can double phone charges.

In fact, our advanced fax software lets you get more work done than using most fax machines. Broadcast faxes to a mailing list... send faxes automatically during lower phone rates... send document files from popular programs like WordPerfect.™ And more.



Cardinal™

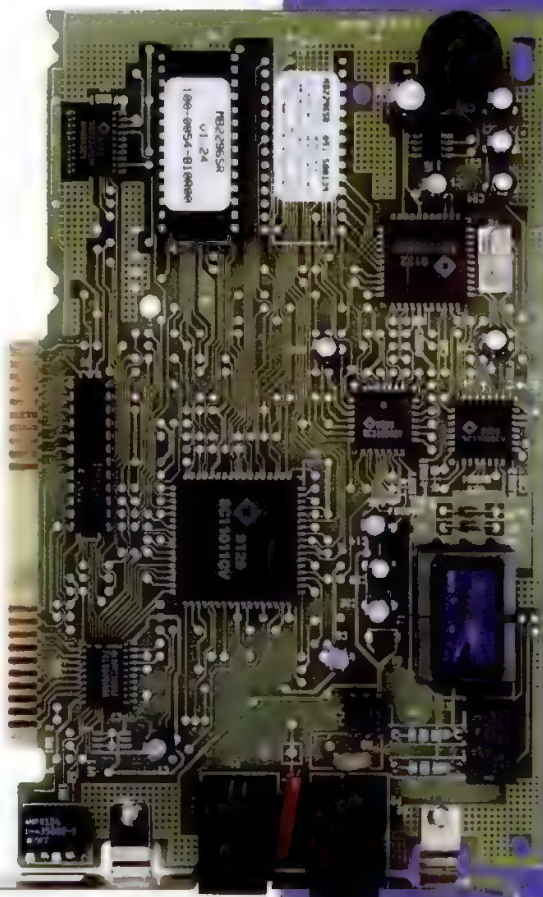
Cardinal Technologies, Inc.
1827 Freedom Road, Lancaster, PA 17601
(800) 233-0187

Where Originality In Technology Begins

All names, products and services are the trademarks or registered trademarks of their respective organizations

©Cardinal Technologies 1991

CIRCLE 319 ON READER SERVICE CARD



AND MODEM

4800 DATA MODEM THROUGHPUT

FASTER MODEM

Get more than fast faxing with the MB2296SR. Call up bulletin boards. Download software. Access your office computer from home. Communicate to standard modems at 2400bps. Or to MNP modems at up to 4800bps throughputs. Of course, you get powerful, easy-to-use communication software and compatibility with all major international standards. All for just \$169.*

If you want to get even faster, our V.42bis Fax Modem (2296V42SR) delivers up to 14,400bps data throughput at only \$239.*

PLUS, FAX FOR WINDOWS™!

Our new Win24SR model includes FLASHlink FAX software for What-You-See-Is-What-You-Fax convenience. Send faxes to anyone in your personal phone book. Add a custom cover letter. All from within a Windows application!

See your local dealer for a view and money-saving Cardinal Fax Modem. Or call us today at (800) 233-0187 for more information.

*Manufacturer's suggested retail price. Dealer prices may vary.

486SX/20s

As for the Windows Workstation's performance on the remaining benchmark tests, its processor and memory scores were above average, as was its disk performance.

All Standard units come with a two-year parts-and-labor warranty, with one year of free on-site service from TRW. The second year's on-site coverage costs a mere \$60. The system is sold direct via mail order and comes with a 30-day money-back guarantee.

Even if it had a fairly standard Super VGA video combination, the Standard 486SX/20 Windows Workstation would be competitively priced at \$3,245 if you consider the other components included. Because of its great video system, however, you should definitely look at this one—though the 386/33 or 486/33 units are more attractive because they are also well priced and offer more performance for the dollar.

SWAN TECHNOLOGIES

Swan 486SX

by Patrick Honan



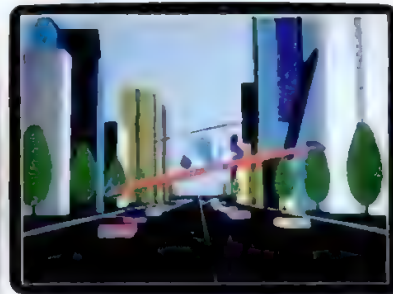
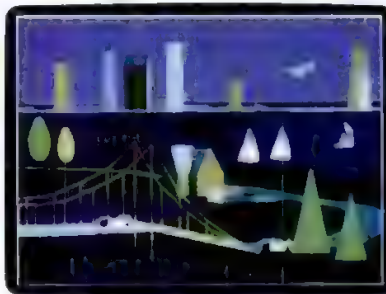
To many users, a system's overall value is more important than any one area. If you agree, the Swan 486SX is worth your consideration. As with all Swan Technology machines, the 486SX is solidly made and comes with an excellent service-and-support policy. Standard performance and expansion room complete the picture.

The Swan 486SX, with 8MB of RAM, a 256K RAM cache, a 227MB hard disk, two floppy disk drives, a 1,024-by-768 video card and monitor combination, and Microsoft Windows 3.0, costs \$3,794.

Swan's 33-MHz 386 system costs \$3,375 for the same configuration, but with 128K RAM cache and a 200MB hard disk. Swan doesn't sell a 486/25, but a 486/33 matching the configuration of the tested machine costs \$4,144.

Though this system comes in a small-footprint case, its three front-accessible 5.25-inch drive bays and one internal 3.5-inch bay may be somewhat restrictive. Add a tape backup unit to the standard configuration and there are no bays left for adding other drives, such as a CD-ROM player, a full-height hard

Create a scene in your living room.



Make mountains. Build bridges. Give rise to rivers and runways. When you add Microsoft® Flight Simulator® Aircraft & Scenery Designer to Flight Simulator 4.0, the world is literally yours.

Because now you can choose from 34 different objects—natural or man-made—and change their size, shape, color and even location to your liking. Ask your Microsoft dealer about it.

You'll get the biggest kicks in the air. While you're having the most fun on earth.

Microsoft

© 1991 Microsoft Corporation. All rights reserved. Printed in the U.S.A. Inside the 50 United States, call (800) 541-1261. Dept. T79, outside the 50 United States, call (206) 936-8661. Customers in Canada, call (416) 566-3503. Microsoft and the Microsoft logo are registered trademarks of Microsoft Corporation. Flight Simulator is a registered trademark of Bruce Artwick.

disk, or a second half-height hard disk.

For those who do want more bays, Swan offers a tower model for \$200 extra. It comes with a 300-watt power supply (the desktop case has a 200-watt power supply), five accessible 5.25-inch

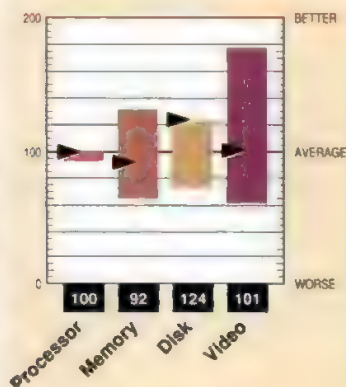
bays, and two internal 5.25-inch bays. Our tested unit had five 16-bit slots, two 8-bit slots, and one slot that accepts a proprietary 32-bit memory board or 8-bit board. A video board occupied one of the PC's 16-bit slots, and an I/O

Swan 486SX



In Short: The Swan 486SX turned in average benchmark test scores, except in hard disk performance, where it turned in the fastest uncached time of the machines we looked at in this roundup. Credit goes to the Hewlett-Packard IDE hard disk, which has a 12.3-millisecond rated access time and a 64K buffer. While its hard disk speed is excellent, the Swan 486SX's storage space—with just one 3.5-inch and three 5.25-inch bays—is not.

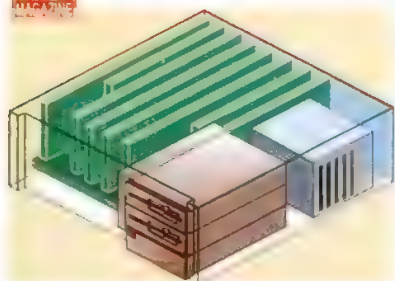
TEST RESULTS



Processor 100, Memory 92, Disk 124, Video 101. The chart shows that the Swan 486SX performed average in most areas, but excelled in disk performance.



FACT FILE



Swan 486SX

Swan Technologies, 3075 Research Dr., State College, PA 16801; 800-468-9044.

List price (tested configuration): \$3,794.

Memory and processor RAM cache: 8MB 80-ns. SIMMs, 256K cache.

Disk drives and controller: Hewlett-Packard 12.3-ms. 227MB IDE hard disk, 1.2MB and 1.44MB floppy disk drives.

Display: Swan 1,024-by-768 adapter with 1MB RAM, Swan 14-inch monitor.

Monitor refresh rate: 60 Hz.

Software: DOS 5.0, Microsoft Windows 3.0, SMARTDRV.SYS.

CIRCLE 426 ON READER SERVICE CARD

board filled an 8-bit slot.

On our processor test, the 486SX's scores landed it in the lower half of a very narrow range. A speedy 12.3-millisecond Hewlett-Packard 227MB IDE hard disk with a 64K buffer gave the 486SX the fastest time—both cached and uncached—on our disk test. However, the tested machine's 80-nanosecond interleaved page-mode SIMMs and 256K of RAM cache garnered a somewhat below-average score on our memory test. Its score on the video test was also average.

Swan backs the machine with a two-year parts-and-labor warranty on all system components. TRW offers on-site service free for the first two years—twice as long as the one-year period most manufacturers offer. In addition, each machine comes with a 30-day money-back guarantee. Toll-free technical support is available weekdays from 9:00 to 9:00 E.S.T., and on Saturdays, Sundays, and holidays from 9:00 to 5:00.

Swan has earned a reputation for manufacturing highly reliable systems; the 486SX's construction and support policies only enhance that reputation. Couple that with the unit's adequate speed and the Swan 486SX becomes a solid choice as a personal system for the home or office.

486SX/20s

ZEOS INTERNATIONAL LTD.

Zeos 486SX-20C

by John R. Quain



A thoroughbred PC from good stock, the \$3,545 Zeos 486SX-20C holds the promise of winner's circle performance. This time around the track, however, the Zeos International PC's good breeding failed to capture the trophy: It yielded quick hard disk and video scores but it fell behind on processor and memory benchmark tests.

Joining the swelling ranks of upgradable PCs, the 486SX-20C's ISA motherboard uses an Intel/VLSI chip set with an 486SX/20 processor and crystal situated on a small plug-in module. Saddled on the module is Intel's 485 Turbocache with 128K of 24-nanosecond external RAM cache. In *PC Magazine's* standard configuration, the system included a 200MB 16-millisecond Western Digital Piranha 4200 hard disk, DOS 5.0, Microsoft Windows 3.0, and a Microsoft mouse. At \$3,545, this tower-cased package is a little more expensive than the small-footprint models in this roundup. However, if you can settle for a stripped-down monochrome 486SX system in an desktop-size case with 1MB of RAM, no RAM cache, a 42MB hard disk, and one floppy disk drive, Zeos will charge you just \$1,595.

Though removing the cover of the 486SX-20C is not easy, once you get inside, you will be pleased with what you find. Only one of the system's eight slots (one 8-bit and seven 16-bit) is occupied. In addition to the two floppy disk drives that come with the system, there is still enough room for a tape backup and a CD-ROM drive, as well as plenty of internal storage space.

As a system grows, so do its memory requirements. The Zeos motherboard can handle 32MB of SIMM memory and came stocked with 8MB of 53-nanosecond DRAM. That's considerably faster than the 70- or 80-ns. memory typically found in PCs, though the Award BIOS also allows the use of cheaper 80-ns. SIMMs. The faster RAM is intended to maintain near-zero-wait-state operation and to anticipate processor upgrades.

Unfortunately, on *PC Magazine Labs'* tests, the faster RAM and 485 Turbocache

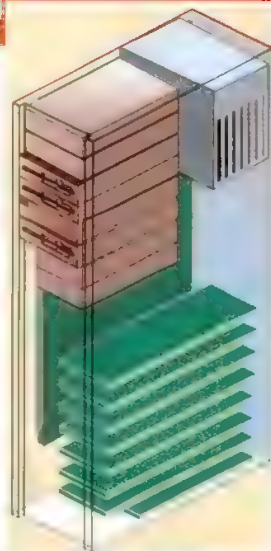
did not make an appreciable difference. The 486SX-20C's memory score was about average, while its processor score was the slowest of the lot. Of the 19 systems we tested, the Zeos PC was one of only two that had an Award BIOS. In addition, there was at least one small circuit patch on the processor upgrade module we tested. Zeos has since eliminated the patch, but we were unable to test a new module in time to include it in this review.

The system's Western Digital hard disk brought about better performance; the 486SX-20C placed first on our disk test. The other excellent test result came from the video side, where this PC ranked in the top three.

Zeos's Super VGA adapter offering is the Tseng-based Diamond SpeedSTAR Plus card with a socketed Sierra Hi-Color RAMDAC. Unfortunately, the 14-inch Zeos Super VGA monitor bundled with the system does not take full advantage of the Diamond board. The monitor cannot



FACT FILE



Zeos 486SX-20C

Zeos International Ltd., 530 Fifth Ave. NW, St. Paul, MN 55112; 800-423-5891, 612-633-4591.

List price (tested configuration): \$3,545.

Memory and processor RAM cache: 8MB 53-ns. SIMMs, 128K cache.

Disk drives and controller: Western Digital 16-ms. 212MB IDE, 1.2MB and 1.44MB floppy disk drives.

Display: Diamond 1,024-by-768 adapter with 1MB RAM, Zeos 14-inch monitor.

Monitor refresh rate: 70 Hz.

Software: DOS 5.0, Microsoft Windows 3.0, Ami Pro, Lotus 1-2-3 for Windows, SMARTDRV.SYS, WinRix.

CIRCLE 427 ON READER SERVICE CARD

NEW TIME LINE 5.0. REALITY NEVER LOOKED SO GOOD.

Schedule projects around vacations and equipment downtime with Individual Resource Calendars.



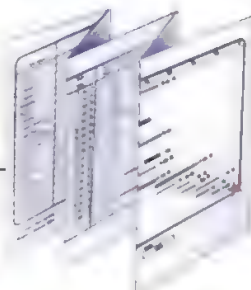
Set dependencies, level resources and view histograms across multiple schedules—over a network or single PC.



Account for project-wide variations in resource productivity (such as new employees) and cost rates (including inflation).



Split Effort lets you track projects more accurately by adjusting a task's end date and duration when progress is updated.



With Resource Contouring™, resources can start, stop and resume tasks based on availability and priorities.



Share information by importing and linking Time Line files to On Target™, our Windows-based project planner for managers and business professionals.



The ultimate test of any project management software is its ability to model reality. If it can't match your real world projects, it simply can't be trusted.

That's why the introduction of Time Line® 5.0 is so important. No PC-based project management program delivers so much precision, power and control.



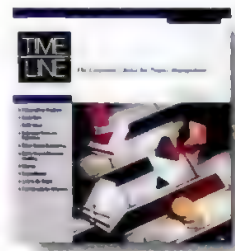
Not only does Time Line 5.0 offer you exceptional planning and tracking capabilities, it also provides the most impressive collection of resource management

tools ever assembled. They enable you to plan with greater accuracy and react to changes whenever conflicts arise.

These unique new qualities of Time Line 5.0 have been combined with the innovative features of Time Line 4.0—including effort-driven scheduling, the unlimited outline structure (now with over 160 data columns), WYSIWYG Print Preview, and Autoscale™ (which automatically fits your output to a single page).

So for a dose of reality, call 1-800-228-4122, Ext. 314P to

upgrade or for a free demo disk. And discover why Time Line 5.0 is the number one choice for serious project management.



SYMANTEC.

COMPUTERS

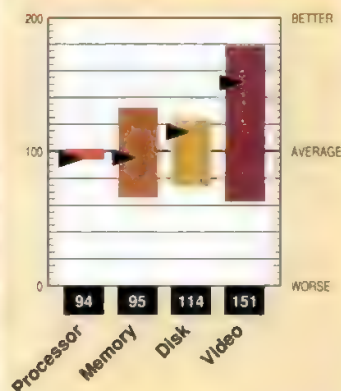
486SX/20C

Zeos 486SX-20C



In Short: A well-armed tower that doesn't quite pack the punch its components promise, the \$3,595 Zeos 486SX-20C allows for plenty of expansion and is upgradable. Its processor and memory benchmark test scores were not awe-inspiring, but its hard disk and video times were very good. The best way to beat this package's combination of service, support, and extras is to purchase the Zeos 486DX for \$200 more.

TEST RESULTS



reach a 72-Hz vertical refresh rate (70 Hz is its maximum), nor can it produce a 1,024-by-768 noninterlaced image. If your

work demands these capabilities, you can purchase an optional Sony CPD-1304C (\$895) or a low-emission NEC

MultiSync 4DS monitor (\$1,225).

The Zeos 486SX-20C still has welcome touches. Remembering the floor placement of the system, Zeos includes extra extension cables for both the keyboard and mouse. The documentation is detailed yet not convoluted. And all systems purchased with Windows 3.0 currently include *Lotus 1-2-3* and *Ami Pro*—for free. Zeos also boasts a one-year parts-and-labor warranty with toll-free 24-hour tech support, 365 days a year. Yet, it seems that Zeos has backed the wrong 32-bit horse. At \$3,745, a comparably outfitted 33-MHz 486DX system from Zeos will only cost you an additional \$200. Based on past PC Labs tests of Zeos 486 systems, we'd say the 486DX is the horse to bet on.

Bruce Brown and Jim Seymour are contributing editors of PC Magazine. Michael Slater is the editor and publisher of Microprocessor Report, an industry newsletter based in Sebastopol, CA. Gary Berline, Joseph Desposito, Patrick Hannon, Edward Perratore, John Quain, and Tom Unger are free-lance writers and frequent contributors to PC Magazine.

DON'T GIVE MONEY TO STRANGERS.

Before you give to a heart organization, make sure it's one you trust: The American Heart Association. Since 1924 we've sponsored lifesaving education programs and funded \$900 million in research. Others may copy us, but they can't hold a candle to our heart and torch. To learn more, contact the American Heart Association, 7320 Greenville Ave., Box 20, Dallas, TX 75231.

You can help prevent heart disease. We can tell you how.



American Heart Association

This space provided as a public service.

CSS:STATISTICA

CSS/3™ Complete Statistical System with over 1,000 presentation-quality graphs fully integrated with all procedures and on-screen graph customization ■ The largest selection of statistics in a single system; in-depth, comprehensive implementations of: *Exploratory techniques; multi-way tables with banners; nonparametrics; distribution fitting; multiple regression; general nonlinear estimation; logit/probit analysis; general ANCOVA/MANCOVA; stepwise discriminant analysis; log-linear analysis; factor analysis; cluster analysis; multidimensional scaling; canonical correlation; item analysis/reliability; survival analysis; time series modeling; forecasting; lags analysis; quality control; process analysis; experimental design (with Taguchi);* and much more ■ Manuals with comprehensive introductions to each procedure and examples ■ Integrated Stats Advisor expert system ■ Extensive data management facilities (powerful spreadsheet with formulas; relational merge; data verification; flexible programming language) ■ Optimized (plain English menus/mouse) user interface: even complex analyses require just few self-explanatory selections (CSS can be run without manual. Quick Start booklet explains all basic conventions) ■ Macros, batch commands also supported ■ All output displayed in *Scrollsheets™* (dynamic tables with pop-up windows and instant graphs) ■ Extremely large analysis designs (e.g., correlation matrices up to 32,000x32,000) ■ Unlimited size of files; extended precision. unmatched speed (Assembler, C) ■ Exchanges data (and graphics) with many applications (incl. Excel®, Lotus 3®, dBASE IV®, SPSS®) ■ Highest resolution output on practically all printers (incl. HP, Postscript), plotters, recorders, typesetters ■ IBM compatibles, 640k or more ■ Price: \$595.

Quick CSS™ Subset of CSS/3: all basic statistical modules (incl. data management) and the full, presentation-quality graphics capabilities of CSS/3 ■ Price: \$295.

CSS:GRAPHICS™ A comprehensive graphics/charting system with data management ■ All graphics capabilities of CSS/3 and, in addition, extended on-screen drawing, 19 scalable fonts, special effects, icons, maps, multi-graphics management ■ Hundreds of types of graphs ■ Interactive rotation and interactive cross-sections of 3D graphs ■ Extensive selection of tools for graphical exploration of data; fitting; smoothing; spectral planes; overlaying; layered compressions; marked subsets ■ Unique multivariate (e.g., 4D) graphs ■ Facilities to custom-design new graphs and add them permanently to menu ■ Import/export of graphs and data, 15 formats ■ Optimized (menu/mouse) user interface: even complex graphs require few keystrokes: all graphs on this page can be produced from raw data in less than 20 minutes ■ Macros, batch/commands also supported ■ Unlimited size of files ■ Highest resolution output on all hardware (see CSS/3) ■ IBM compatibles, 640k or more ■ CSS:GRAPHICS is included in CSS:STATISTICA (available separately for \$495).

Megafile Manager™ Comprehensive analytic data base management system ■ Unlimited size of files (up to 32,000 fields or 8 MB per record) ■ Megafile Manager is included in CSS/3 and CSS:STATISTICA (separately: \$295).

CSS:STATISTICA™ A fully integrated system that combines all the capabilities of CSS/3 and CSS:GRAPHICS into a single extremely comprehensive data analysis system ■ Price \$795.

Domestic sh/h \$7 per product; 14-day money back guarantee



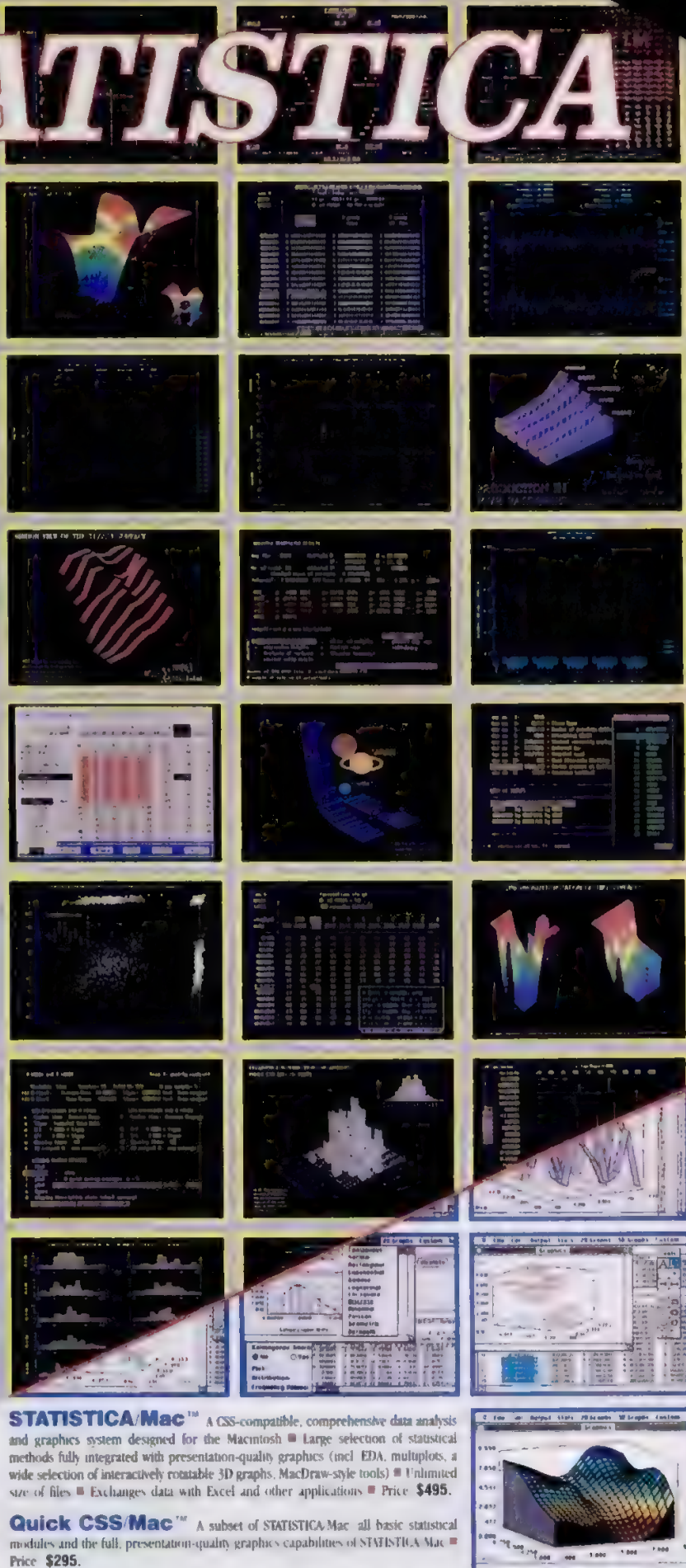
CIRCLE 485 ON READER SERVICE CARD FOR IBM
CIRCLE 496 ON READER SERVICE CARD FOR MAC

StatSoft™

2325 E. 13th St. • Tulsa, OK 74104 • (918) 583-4149
Fax: (918) 583-4376

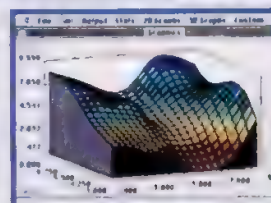
Overseas Offices: StatSoft of Europe (Hamburg, FRG), ph: 040/4200347, fax: 040/4911310; StatSoft UK (London, UK), ph: 0462/482822, fax: 0462/482855; StatSoft Pacific (Melbourne, Australia), ph 613-866-1766, fax 613-866-3318; StatSoft Canada-CCO (Ontario), ph: 416-849-0737, fax: 416-849-0918. Available from: CORPORATE SOFTWARE and other Authorized Representatives Worldwide: Holland: Lemax BV 02065-98701; France: VERSION US (1) 40590913; Sweden: AkademiData 018-240035; Spain: ADDLINK, SRL; ph: 34-3-459-0722.

CSS, CSS/3, CSS:GRAPHICS, Megafile Manager, Quick CSS, STATISTICA, StatSoft, dBase IV, Excel, Lotus, MacDraw, Macintosh, Postscript are trademarks of their respective companies; SPSS is a registered trademark of SPSS, Inc.

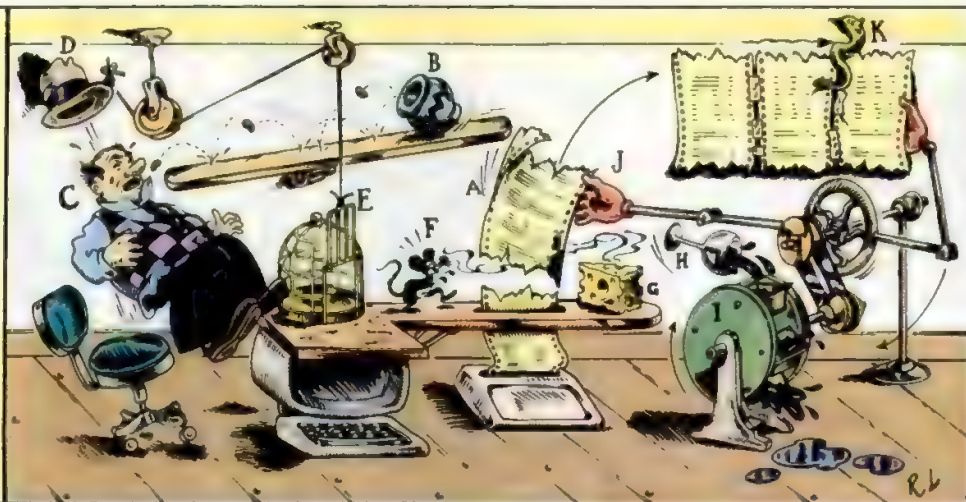


STATISTICA/Mac™ A CSS-compatible, comprehensive data analysis and graphics system designed for the Macintosh ■ Large selection of statistical methods fully integrated with presentation-quality graphics (incl. EDA, multiplots, a wide selection of interactively rotatable 3D graphs, MacDraw-style tools) ■ Unlimited size of files ■ Exchanges data with Excel and other applications ■ Price \$495.

Quick CSS/Mac™ A subset of STATISTICA/Mac: all basic statistical modules and the full, presentation-quality graphics capabilities of STATISTICA/Mac ■ Price \$295.



SHEET IS TAPED SECURELY IN PLACE BY TRAINED ADHESIVE TAPE WORM (K).



CIRCLE 323 ON READER SERVICE CARD

Spreadsheets Begin to Put the User First

*Over the years,
spreadsheets
have competed
on speed and
sophistication,
but for some of
the ten programs
in this review,
ease of use is
finally a virtue.*



In the dramatic Battle of the Giant Spreadsheet Vendors, a new subplot has emerged. Now that most of the big spreadsheet programs include publishing features, optimizers, connections to external database programs, and other specialized paraphernalia, the latest area of competition is making the tasks easier.

It is said that spreadsheet users, like relational database users, tend to spend at least 80 percent of their time using less than 20 percent

BY
CRAIG
STINSON

SOFTWARE SPREADSHEETS

of a program's capabilities. Prior to the arrival of a viable graphical interface for PCs, software developers were either unwilling or unable to do much about it. Spreadsheet designers added functions and commands, but the everyday tasks of adding numbers, copying cells, adjusting column widths, and assigning formats remained as complex as they have always been.

Things have changed for spreadsheets since our last comparative evaluation ("Spreadsheet Heavyweights Take On 1-2-3," April 24, 1990). Since then, the major players in the spreadsheet market have put their biggest research dollars toward the development of *Microsoft Windows* programs.

Microsoft Corp. unveiled *Microsoft Excel*, Version 3.0, at the beginning of 1991, Informix Software upgraded *Wingz*, and Lotus Development Corp. released *Lotus 1-2-3 for Windows* in late August. Borland International recently put *Quattro Pro for Windows* into preliminary testing, and rumors of an impending *Excel*, Version 4.0, are in the air.

CLICK FOR COMMONPLACE TASKS

The race to develop for the *Windows* environment reflects two important realities of today's marketplace: We all want simpler ways to carry out commonplace chores, and after all these years, we're still looking for effective ways to tie applications together. *Windows* provides an environment to help us get what we want, and the software designers know it.

In several of the products examined here, you will see signs of change. In *Excel*, Version 3.0, for example, you can select a block of cells and double-click an Autosum icon to automatically generate a set of formulas adding up the associated rows or columns. Comparable mouse actions let you adjust a column's width automatically to accommodate the column's widest entry, jump from a formula cell to the cell it references, or pop up a window to display a comment associated with a formula.

When you highlight a parenthesis while editing an *Excel* formula, the program

blinks the partner parenthesis, helping you thread your way through the cell's logic. When you want to customize a graph, you can simply double-click the element you want to modify and the appropriate dialog box will appear.

1-2-3 for Windows gives you not only a summation icon but a whole set of mouse shortcuts for the commands you use most often. With this SmartIcon palette, you can finally forget about typing @TODAY or @DATE to date-stamp your worksheet; just click the calendar icon instead. If you forget how to spell a function name, click the @ icon for a pop-up list of functions. *1-2-3 for Windows* lets you put the icon palette wherever you want, modify its contents, and even attach your own macros to icons.

Ease of use is not the only focus. *Excel*, *Lotus 1-2-3 Release 3.1 Plus*, *1-2-3 for Windows*, and the forthcoming *Quattro Pro for Windows* all include nonlinear optimizers that use very sophisticated mathematical techniques to solve resource allocation problems. High-end functionality is still a big part of a successful

SPREADSHEETS: SUITABILITY TO TASK

Spreadsheets are designed to handle a variety of chores. To determine which package is best suited to your goals, we put each program through rigorous routines that test its appropriateness in the following six areas.

In computation and analysis we look at the number of spreadsheet command functions and test their richness in analytic tasks. This category also evaluates the program's precision, formula-writing tools, auditing features, database functionality, and modeling tools (solvers and goalseeking), and its performance on the computation-intensive performance tests.

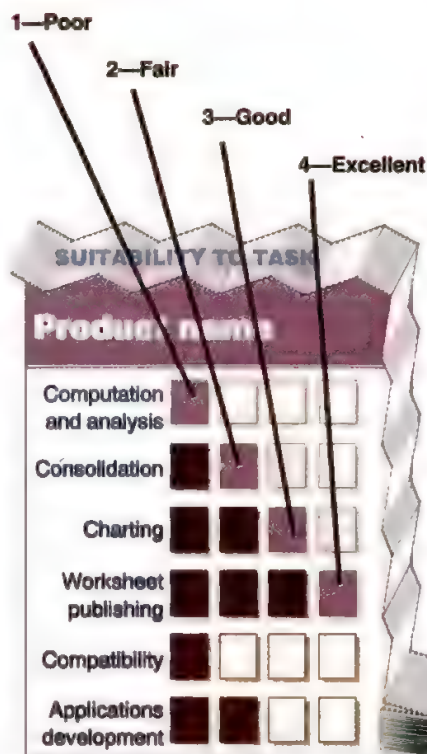
Consolidation rates the true three-dimensionality of the program, its file-linking capabilities and refresh speed, and its range of options for combining and summarizing data across multiple worksheets.

To evaluate a program's **charting**, we look at the number and quality of chart formats. A package receives a high score for the automation of simple charting and the ability to customize a chart with titles, notes, multiple typefaces, and colors.

Worksheet publishing evaluates the spreadsheet's reporting tools, focusing on its ability to place a chart on paper with colors and fonts that match the screen or with high-quality gray scales. We look for box, line, and shading accessories, the ability to import clip art, and the ability to integrate charts and worksheet data on the same page.

Compatibility rates the program's ability to work with other spreadsheet file and macro formats, with emphasis on *Lotus 1-2-3* compatibility. We also tested its ability to write to and query from databases, and to a lesser extent, its presence on other platforms such as OS/2 and the Macintosh.

Applications development examines the extent and flexibility of the spreadsheet's macro language and its ability to produce screens, menus, icons, error handling, and help. We also look for interfaces with other languages and programmers' tools.





ZEOS[®]
Simply the best
notebook you
can buy.

Take it from the experts:



A few expert opinions:

"There's a new king of the hill—the ZEOS Notebook..." — **PC Magazine, Editor's Choice** ■

"ZEOS' Notebook...it's the one to buy..." — **PC World, Best Buy** ■

"The ZEOS Notebook... a clear winner...why settle for less?" — **Byte** ■

"This notebook is a steal." — **InfoWorld** ■ *"The ZEOS beats the Compaq."* — **PC Computing**

■ *"The ZEOS Notebook...delivers astonishing value...sensational."* — **Portable Office** ■

outstanding value." — **PC Week**

Outstanding Indeed! And The Price?

— NOW 16 OR 20 MHz

t and
ded.

Either way, you're sure to appreciate our light weight snap-in, snap-out battery packs. They're so light and easy to use, you can easily take an extra one with you on those really long trips. You can get even more life out of a single charge by using our programmable power management system. Hour upon hour of Notebook computing power!

CONNECTIVITY TOO!

Your new ZEOS notebook is a great connectivity tool. Utilizing our optional built-in 2400 baud MNP Class 5 modem, connectivity buffs will find themselves logging on at every turn. And speaking of connectivity, we've kept the I/O easy to use too. Because unlike many of the others, your new ZEOS notebook has the same industry standard port connectors you'll find on your larger desktop system. Completely compatible! Serial and Parallel ports; even an external VGA connector. All industry standard and ready to go the minute you receive your system.

It's attention to detail that makes the difference. Tens of thousands of hours of development time have been invested. We've been thinking and re-thinking exactly what you want in a notebook, and now we're building it for you. We think you'll agree, it's an incredible product. Plus, your new notebook is backed by the best support in the industry, 24 Hours a Day.

ZEOS 24 HOUR A DAY SUPPORT.

After all, it was ZEOS that invented 24 Hour a Day Toll Free Sales and Technical Support. We're always here to help. Any time you need us your telephone is a Toll Free Hotline—direct to your own personal Technician. 24 Hours a Day, 365 Days a Year.

Now that's ZEOS value. But we don't stop there either.

Your new notebook is also backed by our 30 Day Absolute Satisfaction Money Back Guarantee and One Full Year Limited Warranty. You're going to be very satisfied. We don't just say it. *We Guarantee It.*

ORDER YOUR OWN ZEOS NOTEBOOK NOW!

You can order your new ZEOS notebook *right now*. Simply pick up the phone and give us a call at 800-423-5891. And don't forget the extra goodies. Like larger hard drives, carrying cases, and extra batteries. All these are available now in money saving packages. You're going to love your ZEOS notebook. That's a guarantee!

ORDER NOW TOLL FREE:
800-423-5891

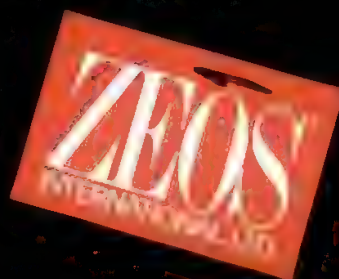
**NOW. YOUR COMPLETE
'386SX-16 NOTEBOOK!
VGA, 20MB HARD DRIVE,
1.44MB FLOPPY AND
MORE. LIGHT AND
LOADED! INCREDIBLE.**

**ONLY \$1795
20MHz ONLY \$1995!**

- '386SX-16 or '386SX-20.
- 1MB DRAM, expandable to 3 or 5MB.
- 20MB High Speed HDD.
- Built in High Density 3.5" 1.44MB floppy drive.
- High Resolution VGA display. Fluorescent backlit 640x480, 32 grey scales. Bright and clear!
- Removable quick charge NiCad battery. Two hour plus battery life typical, more using Programmable Power Management!
- Quick charge or trickle charge using included AC power adapter.
- Extra battery packs and external charging stand available.
- 82 key keyboard. True 101 key emulation.
- Industry standard Serial and Parallel Ports.
- VGA port for external VGA color display. Great for demos!
- Total system weight seven pounds with battery!
- 30 Day Absolute Satisfaction Money Back Guarantee and ZEOS Customer Satisfaction Package.
- One Full Year Limited Warranty.
- 24 Hour a Day Toll Free Technical Support, 365 Days a Year.

ORDER NOW TOLL FREE:
800-423-5891

FAX Orders: 612-633-1325
Minnesota: 612-633-4591
Hearing Impaired (TDD)
Orders: 800-228-5389
Outside US and Canada:
612-633-6131
MasterCard, VISA, Discover,
Am Exp, Z-CARD.
Open 24 Hours a Day,
365 Days a year!



**take desktop
ver anywhere!
ZEOS Notebook.**



Available. All prices and specifications are subject to change without notice. Please call to confirm pricing, specification (Intel Corporation). © 1990, ZEOS International, Ltd., 530 5th Avenue, N.W., St. Paul, MN 55112 USA.

Your New ZEOS Notebook.
Take your pick!

16MHz '386SX
Only \$1795!

20MHz '386SX
Only \$1995!

16 or 20MHz, Hard Drive, Floppy Drive,
VGA, 7 lbs., Beautiful!

Unbelievable.
Believe It!

Call Now!
800-423-5891

The ZEOS Guide to the Perfect Notebook:

 **PROCESSOR:** PC Magazine recommends a '386SX processor pointing out that, "Finally, we've got portable PCs capable enough to be your *only* PC." That's why ZEOS offers you a 16MHz or a 20MHz '386SX! More power for you. After all it's just like a take-anywhere desktop!

 **DRIVES:** Two drives, built in! A whisper quiet high speed 20 Megabyte or larger hard disk plus a 1.44 Megabyte 3.5 inch floppy. Remember, with a built in floppy drive you don't need to fool around with strange interfaces to load and transfer files.

 **VIDEO:** ZEOS raises the ante to VGA! We're talking about bright and crisp VGA displayed on one of the largest notebook screens in the industry. The display also features advanced fluorescent backlighting, 32 grey scales and 640 x 480 resolution. Plus, it can be adjusted to any position over a 135° angle and features easily adjustable brightness and contrast controls. Easy viewing under virtually any lighting conditions. You can connect to an external VGA color monitor too!

 **GREAT BATTERY FEATURES:** Every battery feature you want. You can plug your notebook in and "quick charge" the battery in less than one hour or you can "trickle charge" while in use. Plus, your battery easily snaps out allowing the quick installation of an optional replacement battery. It's great to be able to carry a light weight spare for those especially long trips. An optional battery charger stand is available as well.

 **INTELLIGENT POWER MANAGEMENT:** Your new ZEOS notebook features an intelligent programmable power management system if you wish to use it. Based on the length of time since your last keystroke, you may reduce CPU speed, display screen backlighting etc. Full power is immediately restored at the stroke of any key. The system even knows *not* to use the power management system when you are operating on AC power!

 **SYSTEMS STATUS AT A GLANCE:** Yes, monitor eight key system components at a glance! We've equipped your new notebook with eight LED indicators which monitor disk access, keyboard functions and power status. There is even an audible alarm

which may be programmed to inform you of a low battery condition and to let you know if the cover is closed with the power on. Now that's one smart notebook!

 **DESKTOP KEYBOARD FEATURES:** We're talking 82 full size keys with full 101-key emulation. And the keyboard isn't squeezed either. The distance between the "Q" key and the "[" (left bracket) key measures 7.5 inches, just as PC Magazine suggests. The keys are of standard size, plus touch typists will love our full 3.5mm keystroke. Type for hours and love it!

 **CONNECTIVITY AND I/O:** Keeping in touch is easy when you order our internal 2400 baud MNP Class 5 modem. Simply plug in the phone line and dial away. How about I/O ports? Many notebooks don't have them and if they do they're often non-standard. But your ZEOS notebook has *industry standard* I/O—serial, parallel and VGA. Just like your desktop!

 **FCC & UL APPROVALS:** Your new ZEOS notebook features both FCC Class B and UL approvals. We've also met CSA and VDE requirements too, just for good measure. Quality and reliability.

 **WATCH THE DETAILS TOO:** Like memory expandability. One Meg comes standard, you can also order a total of 3 or 5MB as a factory option. And lots of other details. Like a recessed power-on reset button, a soft carrying handle, built in speaker and more. You're going to love it! And there's no reason to wait.

CALL NOW TOLL-FREE:

800-423-5891

CHECK IT OUT!

Now, you can take desktop computing power anywhere! Your ZEOS notebook has many features of obvious importance. Also, there are a number of features that are subtle yet critical to your ultimate satisfaction. We'll go over them here one by one. We think you'll agree your new ZEOS Notebook is the one for you!

Folded edge of the page

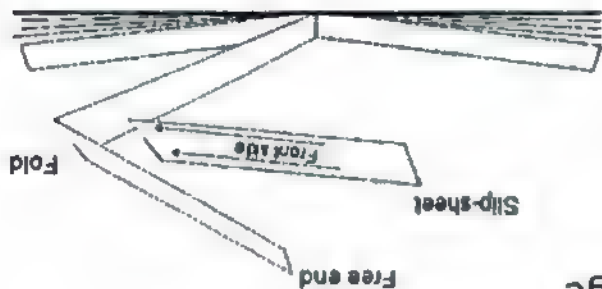


GbsSlipSheet-001

Inverted Foldout slip-sheet

Foldout slip-sheet

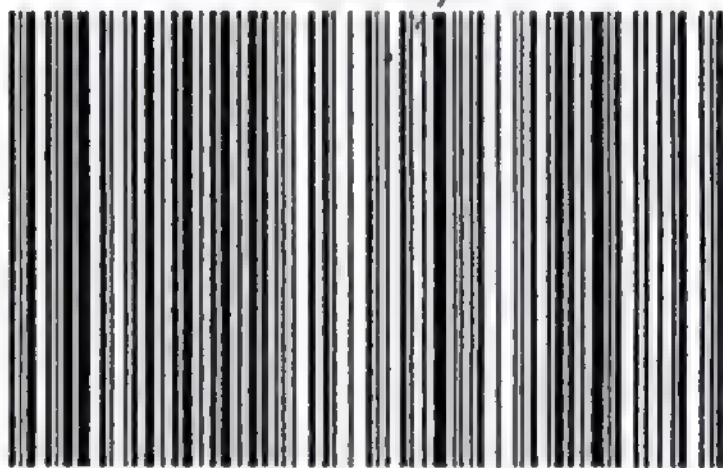
1. Open the foldout page
2. Insert this sheet with
1. Front side touching the free page
2. Arrow pointing to the fold
3. Slice the folded edge
4. Close the page and slip-sheet



1. Follow instructions on the other side

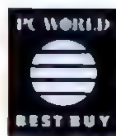
Back

GbslipBack-0018



Inverted Back

1. Follow instructions on the other side



**"THE HOTTEST DEAL
ON THE NOTEBOOK
MARKET"
—PC MAGAZINE,
EDITOR'S CHOICE**

"King of the Hill... Sensational... The best price-performer... Astonishing value... A steal... The number one contender..." We couldn't have said it better ourselves. Winner of PC Magazine's Editor's Choice Award and PC World's Best Buy Award, the experts love the ZEOS Notebook. And you'll love it too. At only \$1795 for our '386SX-16MHz version and \$1995 for our new 386SX-20, you simply can't find a better notebook anywhere!

As PC Magazine said, the ZEOS Notebook "offers a top notch combination of power, weight, features and price..." And you can pick your power! Choose our '386SX-16MHz version or go for the incredible new ZEOS '386SX-20MHz. Combine either with our high speed hard disk, built in 1.44MB floppy drive, VGA and more—you've got the greatest notebook going at any price!

INCREDIBLE DESKTOP FEATURES IN A NOTEBOOK.

In fact, it's really like owning a full featured desktop that you can take with you anywhere! Look closely at the details. Like our crisp 10" VGA display. The ultimate in sparkling clarity, it features advanced fluorescent backlighting for vivid VGA graphics. Then, the drives.

Two drives are better than one!

First, your notebook will include our whisper quiet high speed, high capacity hard disk. It will read and write your data so fast chances are you'll hardly know it's there. Then we're building in an industry standard 1.44 Megabyte 3.5 inch floppy as well.

While most notebooks don't include a floppy drive at all, you're really going to appreciate your ZEOS notebook's industry standard 3.5" floppy. It makes loading software and transferring files a breeze. Simply toss in your 1.44 and it's done. Anyway, can you imagine a desktop system without a floppy? We couldn't either. That's why your ZEOS notebook has one. It's great!

But the features of your incredible new ZEOS Notebook don't just stop there. Detail after detail we're giving you more than anyone else. Much more, for much less. Take a closer look.

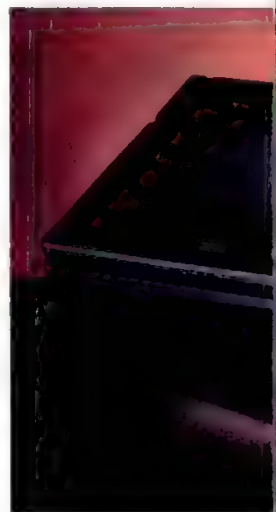
DETAILS MAKE THE DIFFERENCE!

For instance, the battery system of your new notebook is the most advanced on the market. You can quick charge, or trickle charge, any time your system is plugged in. You can also take the battery out and use the optional charging stand if you wish.

Light Load

From

**Now, you can
computing power
The incredible Z**



10 Good Reasons To Buy From ZEOS®

Reason #1

"Overall Excellence."

As *PC Magazine* said "Price is always a consideration. So are benchmark test results. But both factors can be deceiving, which is why we consider them in the context of other aspects that will make the difference months and years down the road."

These are the attributes which *PC Magazine* used in awarding ZEOS the coveted Editor's Choice, not once but *eight* times. And "Overall Excellence" are the very words *PC Magazine* used in describing ZEOS systems comparing them to all others.

Reason #2

Dazzling Performance.

In one recent '386 review, *PC Magazine* awarded ZEOS Editor's Choice. "The ZEOS '386 blows away every other computer... a smart choice" is what they said. And in another recent review, *Government Computer News* said the ZEOS 33MHz '386 is "arguably the fastest MS-DOS and OS/2 micro in the world."

Dazzling Performance is built into every ZEOS system. It's a key component of ZEOS Overall Excellence.

Reason #3

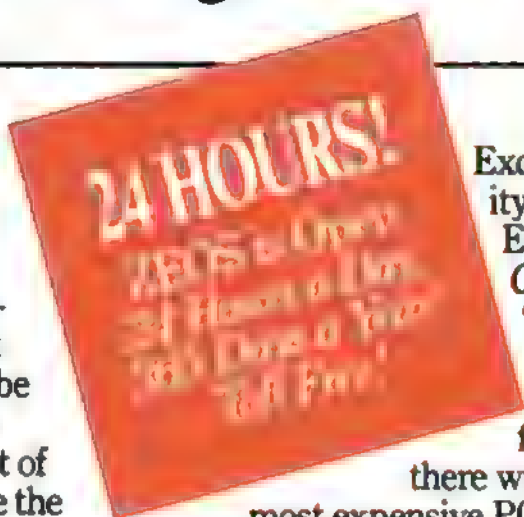
Exceptional Quality.

PC Resource Magazine put it this way, "ZEOS... provides quality comparable with IBM or Compaq and does so for about 70% of the price." ZEOS uses only the very best components. And every system is fully tested and burned-in right in our own labs.

Reason #4

Value.

InfoWorld says, "We find the ZEOS '386 an excellent value. Speed:



Excellent. Compatibility: Excellent. Value: Excellent." *Personal Computing* said, "ZEOS... is the best value we've come across... its performance is right up there with the slickest, most expensive PCs you can buy."

Reason #5

Warranties and Guarantees.

ZEOS believes in its products. That's why we offer each and every customer our 30 Day Absolute Satisfaction Money Back Guarantee, no questions asked. Plus, our One Full Year Limited Warranty and Express Parts Replacement Policy. Optional On Site Service is available too. Call for details.

Reason #6

24 Hour Toll Free Technical and Sales Support.

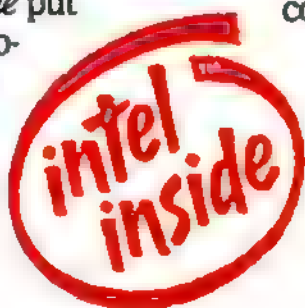
At ZEOS, the customer is #1. That's why we invented 24 Hour a Day Tech Support. For *your* convenience. If you buy a product from us we feel we should be there to help, any time of the day or night. Give us a call Toll Free! 800-423-5891. Anytime!

Reason #7

Experience.

Almost unique in the mail order computer industry, ZEOS maintains its own chip level Research and Development staff. In addition to Systems Manufacturing, we also operate our own Board Level Manufacturing facility.

ZEOS has been involved in Research and Development since our incorporation back in 1981. Our strong and experienced Research, Manufacturing and Technical Staff translates into superior factory direct computer systems for you.



Reason #8

A Sterling Reputation.

In magazine after magazine and review after review ZEOS systems are cited for Overall Excellence, for Excellent Value, as the Right Choice and so on. All of this is flattering but the most important thing is this: What do our customers think? Frankly, they love us. The systems and the support. That means more to us than anything.

Reason #9

Easy to Buy.

ZEOS systems are easy to buy. You can pick up the phone any time of the day or night and order your new ZEOS computer. And we accept MasterCard, Visa, Discover, American Express, and Corporate Purchase Orders from Fortune 1000 Companies, Colleges, Universities and Governments. Complete Leasing Programs are available as well.

And now the Z-CARD! It's your very own ZEOS Credit Card and you can apply today. With the Z-CARD you can charge your ZEOS purchases and pay in easy monthly installments. It's just like a Bank Card. Why not apply for your Z-CARD now!

Reason #10

You're Going to be Very Satisfied.

When it comes right down to it, you're going to be very satisfied with your new ZEOS system. Our goal is your complete satisfaction. And that's our commitment to you. To quality. To performance. To reliability and support. To *Value*. We don't just say it, *we Guarantee it!*

FAX Orders Dial: 612-633-1325
In Minnesota Call: 612-633-4591
MasterCard, VISA,
Discover, AmEx,
Z-Card and COD
Open 24 Hours a
day, 365 Days
a year.

Order Now
Toll Free

800-423-5891



Apply Now for the Z•CARD!

NO ANNUAL
FEE!

SEND FOR YOUR ZEOS CREDIT CARD



- Low Consumer Rate!
- No Annual Fee!

Now you can send for your own ZEOS Credit Card. It works just like a MasterCard or Visa for ZEOS purchases.

Fill out your Z•Card™ Application and mail it today to ZEOS International, Z•Card Processing Center, 530 5th Avenue N.W.,

St. Paul, MN 55112. We'll give you a call as soon as your credit line is established!*

Please complete all appropriate sections, *providing at least two years residence and employment history*. **THIS IS NOT A CREDIT AGREEMENT!** One will be sent to you upon authorization of an account. (This Form Must Be Signed To Process Your Order.) All Financed Purchases Are Subject To Credit Approval. **If You Have Any Credit Questions, Please Call 800-421-8942 For Assistance. Thank You!**

A married person may apply for individual credit. I am applying for (please check appropriate box):

- ☐ **JOINT CREDIT** with another person. Complete entire application.
- ☐ **INDIVIDUAL CREDIT** but rely on income or assets of another person as a basis for repaying the credit requested. Complete entire application.
- ☐ **INDIVIDUAL CREDIT.** Do not complete Section C.**

**If you are a married Wisconsin applicant, you must provide your spouse's information as indicated, even though your spouse may not be signing the contract.

NOTICE TO WISCONSIN APPLICANTS:
YOU MUST DISCLOSE YOUR MARITAL STATUS:

☐ married ☐ unmarried ☐ legally separated

A. YOUR PERSONAL INFORMATION

Name _____

Home Phone (_____) _____

Soc. Sec. No. _____ Date of Birth ____/____/____

Address _____ Apt. _____

City _____ State _____ Zip _____

Since? (Mo./Yr.) _____ ☐ Buy ☐ Rent ☐ Other _____

Previous Address _____

City _____ State _____ Zip _____

Employer _____ Since? (Mo./Yr.) _____

Monthly Gross Salary \$ _____ Daytime Bus. Phone (_____) _____

Previous Employer _____ From - To _____

Occupation _____

Income from alimony, child support or separate maintenance payments need not be disclosed if you do not wish to have it considered as basis for repaying this obligation.

Additional Monthly Income \$ _____ Source: _____

Name & Address of Nearest Relative Not Living With You _____

Relationship _____

B. CREDIT INFORMATION

PLEASE TELL US IF YOU HAVE: Checking Account ☐ Yes ☐ No Savings Account ☐ Yes ☐ No

	Y/N	How Many?	Y/N	How Many?
Bank Loan	_____	_____	Dept. Store Charge Card	_____
VISA	_____	_____	Credit Union Account	_____
MasterCard	_____	_____	Other Major Charge Cards	_____
Finance Company Loan	_____	_____		

C. JOINT APPLICANT INFORMATION

Joint Applicant's Name _____

Soc. Sec. No. _____ Date of Birth ____/____/____

Address _____ Apt. _____

City _____ State _____ Zip _____

Home Phone (_____) _____ Date of Residence (Mo./Yr.) _____

Joint Applicant's Employer _____ Since? (Mo./Yr.) _____

Bus. Phone (_____) _____ Monthly Gross Salary \$ _____

CUSTOMER AUTHORIZATION

I authorize ZEOS International, Ltd. or its assignees to investigate credit records and to report my performance hereunder to credit agencies. I hereby certify that the following information is furnished to you for the purpose of obtaining credit and is true and correct to the best of my knowledge and belief.

Applicant's Signature _____

Date _____

Joint Applicant's Signature _____

Date _____

FOR MARRIED WISCONSIN APPLICANTS:
I acknowledge that the obligation described herein is being incurred in the interest of my marriage or family.

Buyer's Signature _____ Date _____

There are costs associated with the use of this credit card. To obtain more information about these costs, call us at 800-421-8942 or 612-635-0613 or write to ZEOS, Z•Card Processing Center, 530 5th Avenue N.W., St. Paul, MN 55112.

NY—A consumer credit report may be requested in connection with this application or in connection with updates, renewals or extensions of any credit granted as a result of this application. If I subsequently ask for this information, I will be informed whether or not such a report was requested and, if so, the name and address of the agency that furnished the report.

OH—THE OHIO LAWS AGAINST DISCRIMINATION REQUIRE THAT ALL CREDITORS MAKE CREDIT EQUALLY AVAILABLE TO ALL CREDITWORTHY CUSTOMERS AND THAT CREDIT REPORTING AGENCIES MAINTAIN SEPARATE CREDIT HISTORIES ON EACH INDIVIDUAL UPON REQUEST. THE OHIO CIVIL RIGHTS COMMISSION ADMINISTERS COMPLIANCE WITH THIS LAW.

*Financing not available in Alaska, Hawaii or outside the continental U.S.

■ Microsoft Excel

If a spreadsheet designer's dream is to combine sophisticated analytical features with ease of use, the dream is most nearly realized in *Microsoft Excel*, Version 3.0.

Excel includes the most extensive set of features, the most comprehensive development language, and the broadest array of publishing features available. It also comes with a nonlinear solver, a goalseeker (backsolver), and a consolidate command that's versatile enough to handle disparate worksheets.

Excel is the only spreadsheet program to offer worksheet outlining, memory-saving array formulas, and user-definable numeric formats, including case fraction formats for listing stock prices. It's not the only one with auditing functionality, but its flexible approach to annotating and naming cells does the best job of eliminating logical errors before they're committed.

Excel's chief failing is its lack of full *Lotus 1-2-3* compatibility. While it offers keystroke help for *1-2-3* users, *Excel* does not adequately translate *1-2-3* macros, and though it has hooks for third-party add-in products, it doesn't support add-ins written for *1-2-3*.

Because *Lotus 1-2-3* compatibility is absolutely essential to many users, two products deserve honorable mention: *Lotus 1-2-3 for DOS*, Release 2.3, and *Quattro Pro*, Version 3.01. With *Lotus 1-2-3* macros and keystroke habits, you will be at home with either program. Both packages come with extensive publishing features and an optional graphics-mode display and require no more than 512K to run.

Quattro Pro, with its ability to work on up to 32 files at once, is a better choice for those who need to consolidate. Because *1-2-3*, Release 2.3, supports the rich world of *Lotus* add-in products, we recommend it for those who need specialized analytical add-in tools, such as forecasting packages.

SOFTWARE

SPREADSHEETS

spreadsheet, but in the near term you can expect to see a great deal more creative energy directed toward transforming the ways in which everyday tasks are performed.

APPLICATIONS INTEGRATION AT LAST?

We are also moving closer to the elusive goal of seamless integration. All current *Windows* spreadsheets support dynamic data exchange (DDE), which allows you to hotlink data from your worksheet to a document created by another program with a simple cut-and-paste procedure. For example, you can paste a live *1-2-3 for Windows* table into a report written in *Ami Pro*; if the numbers change on the worksheet, the word processing document updates itself automatically.

Excel supports object linking and embedding (OLE) as well as DDE. Borland has said that *Quattro Pro for Windows* will also support OLE, and *Lotus* has promised OLE support for the next version of *1-2-3 for Windows*. With a worksheet table linked into a word processing document via OLE, you'll not only have up-to-date numbers in both applications at all times, you'll be able to invoke the source worksheet simply by double-clicking the table. OLE will also simplify the annotation of spreadsheet files with sound, graphics, text, and even video.

TEXT MODE LIVES ON

Though the desire for simplicity and integration is making *Windows* spreadsheets look very good, the wealth of user experience, the millions of lines of macro code, and the highly developed *1-2-3* add-in market ensure a long and healthy future for character-mode spreadsheets.

Since our last evaluation, *Quattro Pro* (which still requires just 512K RAM) has seen two formal upgrades and a minor touch-up release, and *Lotus* has refurbished both the classic and three-dimensional versions of its DOS spreadsheets. While a legal dispute between *Lotus* and *Borland* remains unresolved (*Lotus* has sued *Borland* for *Quattro Pro's* inclusion of an optional *1-2-3*-style menu tree), the two publishers' competition continues with unabated intensity.

In 1991, *Lotus* continued adjusting the balance of features between its two DOS spreadsheets by introducing *Lotus 1-2-3 for DOS*, Release 2.3, and *Lotus 1-2-3 for DOS*, Release 3.1 Plus. The original Re-

lease 3.0 outpowered Release 2.2 by offering 3-D worksheets and access to external database files, but it required extended memory and a 286 processor. It also lacked the publishing features included with Release 2.2's *Allways* add-in.

Lotus first remedied the publishing deficiency in Release 3.0 by shipping the

In 1991, Lotus

continued adjusting

the balance of

features between its

two DOS spreadsheets.

WYSIWYG add-in (an adaptation of *PC Publishing's Impress*) with Release 3.1. Then it replaced *Allways* in the Release 2.0 line with WYSIWYG, threw in a file viewer add-in and an auditor add-in, and called the package Release 2.3. Finally, to keep the Release 3.0 line more advanced than Release 2.3, it put the same viewer and auditor add-ins into the Release 3.1 box, along with an add-in version of the Solver (the nonlinear optimizer that had debuted earlier in the ill-fated OS/2-based *1-2-3/G*), and called it Release 3.1 Plus. (It's still an upgrade from Release 3.1 and carries the customary \$150 upgrade price tag.)

With these changes, the *Lotus* lineup for DOS now presents an orderly progression of power. Release 2.x and Release 3.x now both use the same publishing utility and come with a file viewer and an auditor. But Release 3.x goes beyond Release 2.x by doing 3-D spreadsheets, external database connections, more-versatile file linking, and nonlinear optimizing.

Borland has added an optional graphics-mode display—coincidentally named WYSIWYG—to *Quattro Pro* and a feature called Paradox Access, which lets users with 2MB or more of extended memory run *Paradox* alongside *Quattro Pro* in a single work session.

Quattro Pro and the two DOS versions of *1-2-3* now have one important thing in common. All of the versions allow you to switch back and forth between character-mode and graphics displays, as needs dictate. For data entry and analysis, you can enjoy the snappy screen and keyboard

With MacLinkPlus/PC, Transforming Files Between PCs And Macs Is Amazingly Simple.



Transforming files between PC and Macintosh formats can be a real beast. But now there's an amazingly simple way to make Mac and PC files totally at home in each other's alien environment.

Introducing MacLinkPlus/PC. The first fully functional, truly simple way to access any Mac files on your PC, with all their content and formatting preserved.

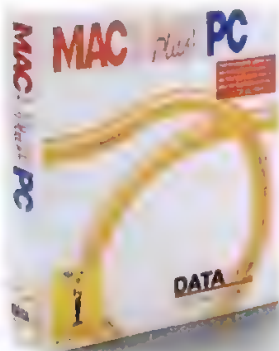
Whether you're running applications under MS-DOS or Windows.

MacLinkPlus/PC is the complete solution for transferring and translating Macintosh files to and from your PC. And since 1984, it's been the very best.

Our vast library of file translators is packed with over 400 translation combinations for all popular word processing, graphics, database and spreadsheet applications. We've also included a serial cable and easy communications software for connecting your PC to a Mac and transferring files, as well as a complete interface for both Windows and MS-DOS.

In businesses where more and more Macs and PCs are sharing desk tops, MacLinkPlus/PC is a product you can't afford to be without.

Get MacLinkPlus/PC today. And watch all your Macintosh files transform themselves before your very eyes. For more information, call DataViz at (800) 733-0030. We'll show you a whole new way of looking at Mac files on your PC.



DATAVIZ[™]
THE DATABRIDGE SPECIALISTS

PEACHTREE ACCOUNTING MAKES EVERY PENNY COUNT.

W

hen you're running your own business, every financial decision is an important one. Make sure you're getting the most out of your business dollar with the best value in accounting software, The Peachtree Double Bonus Bundle ■

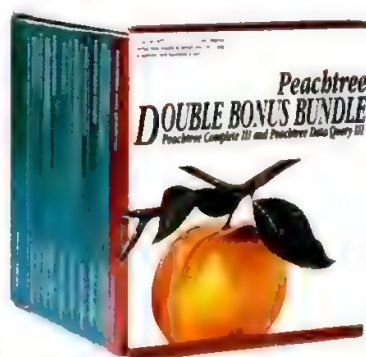
Peachtree Software has been the leader in accounting software for over 13 years. Now we've combined two high-powered programs into one value-packed bundle — Peachtree Complete® III, a comprehensive accounting system, and Peachtree Data Query® III, a custom reporting and analysis tool ■

Peachtree Complete III has nine powerful modules, each loaded with features you'd expect to find in much higher priced packages:

- General Ledger
- Accounts Payable
- Accounts Receivable
- Payroll
- Inventory
- Invoicing
- Purchase Order
- Fixed Assets
- Job Cost

Easy to Use

The modular design of Peachtree Complete III makes it easy to implement the functions you need now, then add others as your business expands. Everything you need to start setting up accounts and processing your financial



\$298

information is included in the package. There's a Quick-Start Guide to help you load the program, as well as a DOS and Accounting Primer plus a nine-volume reference library. Each module has on-line tutorials that help you learn accounting as you install the program, and context-sensitive HELP is available any time you need assistance ■



\$199

Flexible, Powerful Reporting

The management reporting capabilities of Peachtree Data Query III give you a unique view of the accounting data in your Peachtree Complete III files. Whether you choose one of the 50 pre-defined reports or customize your own, PDQ lets you get to the meaning behind the numbers with historical reports and complex analyses to give you a more complete picture of your business finances ■

With PDQ you can even read and report on data from your Lotus 1-2-3® spreadsheets, and export data to Lotus 1-2-3, dBASE® and other popular applications with no re-keying of data and no risk to your files ■

Best of all, you won't sacrifice ease of use to get the power and performance your business needs. There's an on-line tutorial in each module, so you can learn accounting as you set up your files. Context sensitive HELP is on-line at all times. Peachtree provides a

thorough reference library, including a quick-start installation guide and Accounting Primer to assure that you'll be up and running quickly. Errors are handled with understandable, plain English messages and suggestions ■

Highly Recommended

In a recent survey by *Accounting Today* magazine, Peachtree was recommended by accountants almost twice as often as the nearest competitor. When *Reseller Management* asked resellers which accounting package they recommend, Peachtree came out on top again, with 25% of resellers recommending it ■

Most importantly, users recommend Peachtree! Based on reader response, *Computer Shopper* named Peachtree Software the Best Buy in Accounting Software for 1990, and Peachtree Complete III received the 1991 World Class Award from *PC World*. More than 400,000 small businesses trust their accounting to Peachtree ■

We're Not Satisfied Until You Are

Convenient technical support may be purchased from Authorized Support Centers in over 80 cities across the country or through prepaid support contracts directly from Peachtree. We stand behind our products with an unconditional 60-day money back guarantee. If you aren't satisfied with your Peachtree product, simply return it within 60 days for a prompt refund ■

Call now to order

or for the name of a dealer in your area

1-800-247-3224

or to order by Fax 404-564-5888

Add \$12.50 shipping. In Georgia, add applicable sales tax. Telephone number required on all orders.



Peachtree Software

1505 Pavilion Place • Norcross, GA 30093

Hardware Specifications: Requires PC/MS-DOS version 3.1 or higher (supports DOS 5.0) with 640K of memory and a hard disk. For use with IBM® PC, PC XT, PC AT, Personal System/2™ and compatibles. Alternate media optionally available. Not copy protected. Product names referenced are trademarks and registered trademarks of their respective manufacturers.



Give every workstation the power of Peachtree with Peachtree Complete Network Accounting!

Now your entire staff can access the full-featured accounting power of Peachtree Complete III plus the custom reporting capabilities of Peachtree Data Query III in one multi-user package — Peachtree Network Accounting. Multiple users may use a single module simultaneously. Most modules allow several operators to perform the same function at the same time for the same company. But don't worry — we've provided three levels of optional password security to protect your confidential accounting data. Peachtree Complete Network Accounting is available now for use with Novelle®, LANtastic™ and other NETBIOS compatible LANs. **\$695**

response afforded by character mode, reserving the slower graphics display for those times when you need to prepare a formal presentation.

HOW TO SELECT A SPREADSHEET

Whether you're buying your first spreadsheet program for personal use or upgrading a thousand users, consider these questions: Do you want a *Windows* program or a DOS program? What degree of *1-2-3* compatibility do you require? Do you have particular application or cross-platform interoperability requirements that only certain spreadsheets can meet?

The three *Windows* programs reviewed here offer distinct levels of Lotus compatibility. *1-2-3 for Windows* handles files and macros from Release 2.x and Release 3.x files with almost no compatibility problems. *Excel* reads and writes .WK1 and .WK3 files but not the formatting information created by WYSIWYG, and converting Lotus macros to *Excel*'s macro language requires considerable effort. *Wingz* has many virtues, but Lotus compatibility is not among them.

If you're staying in DOS and need 100 percent *1-2-3* compatibility, your decision is simpler. Choose *1-2-3*, Release 3.1 Plus, if you do a lot of worksheet consolidation or need access to external database files (and if you have at least a 2MB 286 machine). Otherwise stick with Release 2.3. It's faster on-screen, and you'll be able to avail yourself of hundreds of add-in products that don't run in Release 3.1 Plus.

DOS users whose needs for Lotus compatibility are lower have a tougher call to make. *Quattro Pro* reads and writes Lotus files without translation, plays and records *1-2-3*-compatible macros, and offers inducements such as a macro debugger, a slide-show utility, a DOS shell, and the ability to work with multiple files in tiled or overlapping windows. On the other hand, it doesn't accept *1-2-3* add-ins, and it allows fewer type styles per worksheet than Release 2.3 or Release 3.1 Plus.

If compatibility across Macintosh, *Windows*, and OS/2 platforms is important, you currently have two worthy choices: *Excel* and *Wingz*. The latter comes with *Windows* and OS/2 versions in the same box, both for \$495. *WordPerfect* users who can get along without total Lotus compatibility should look closely at the current version of *PlanPerfect*, while those hunting for high-end features at low prices

SOFTWARE SPREADSHEETS

will be drawn to Computer Associates International's package, *CA-SuperCalc*, Version 5.1.

Finally, consider whether spreadsheet maximus is really what you need. If your numeric needs don't encompass every spreadsheet feature known to man, you have three additional attractive choices: the bargain-priced *InstaCalc*, the cheap and speedy *Lucid 3-D*, and *Quattro Pro SE*. Shipped too late for inclusion in this roundup, *Quattro Pro SE* includes all of its namesake's features except WYSIWYG, network support, and the *1-2-3* menu tree; the price is \$69.95.



CA-SuperCalc

by Bruce Brown

In the early 1980s, before the arrival of *Lotus 1-2-3*, *SuperCalc* was the spreadsheet of choice for CP/M machines (the business systems of the day). It also happened to be very good, including consolidation features not found in other programs, including *Lotus 1-2-3* prior to Release 3.0.

SuperCalc has been updated several times in the past ten years, but it never gained a very large share of the PC spread-



CA-SuperCalc, Version 5.1

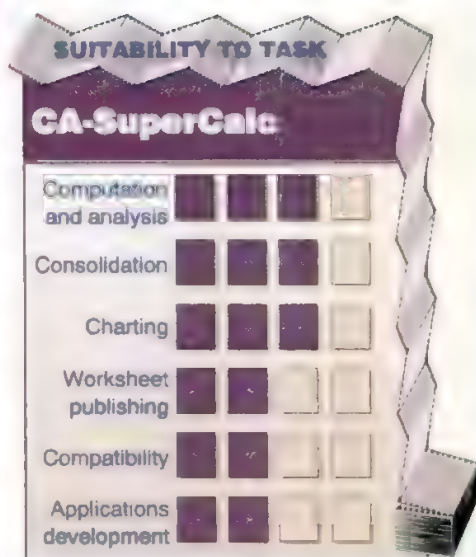
Computer Associates International Inc., 711 Stewart Ave., Garden City, NY 11530; 800-645-3003, 516-227-3300.

List Price: \$149.

Requires: 512K RAM, DOS 3.0 or later.

In Short: *CA-SuperCalc*, Version 5.1, is a bargain at \$149, considering the features and functions it includes for the price. However, many of the functions require inordinate patience as you move through the multilevel menus.

CIRCLE 399 ON READER SERVICE CARD



sheet market. Computer Associates International's *CA-SuperCalc*, Version 5.1, lists for \$149 and has many powerful features including three-dimensional functionality, but it is held back by an interface that hasn't changed much over the years. Version 5.1 is a good upgrade for anyone using an earlier version of *SuperCalc*, but it has no compelling attraction for other spreadsheet users (except its competitive price, of course).

CA-SuperCalc is a text-mode program that doesn't support a mouse. Bowing to the preeminence of *Lotus 1-2-3*, *CA-SuperCalc* reads and writes .WKS and .WK1 data and macro files directly (up to *Lotus 1-2-3*, Release 2.01) and even has a selectable Lotus menu mode with a command tree compatible with *1-2-3*, Release 2.01. Menus in both *1-2-3* and *CA-SuperCalc* modes appear on the bottom of the screen, and commands can be selected by single letter keys or by moving the menu highlight via the cursor control keys. Pull-down menus are used to create graphics, but otherwise you need to wade through often ponderous hierarchal function menus to find what you need.

MULTILAYERED MENUS

CA-SuperCalc includes context-sensitive on-line help, but it's still easy to get lost. The first menu level has 21 different choices, many of which are five or six command levels deep. Hit // to bring up an alternate menu and you find another ten main menu areas. Moving through the menus can be confusing and time-consuming, especially for functions such as printing (called Output), which may call for settings in several menu areas.

Had your fill

1990 World Class Award for
Best Mail-Order Company



□ 3 1/2" format available from us. Specify when ordering.

▣ package includes both 5 1/4" and 3 1/2" disks.
▣ 3 1/2" format available from manufacturer by request. Call us for details.

CP—copy-protected; NCP—not copy-protected.

The four-digit number next to each product is the product's ITEM NUMBER. Please refer to this number when ordering. Thank you.

SOFTWARE

We carry only the latest versions of products. Version numbers in our ads are current at press time. Products listed here in red are Microsoft Windows Applications.

Adobe Systems ... NCP

- 7547 ▣ Adobe Type Manager 1.1 for Windows \$69
- 9623 ▣ Adobe TypeAlign 1.0 for Windows 69
- ▣ Adobe TypeSets for Business ea 95
- 9874 ▣ Adobe TypeAlign 1.0 w/ATM 125
- 7928 ▣ Adobe Plus Pack 1.0 129
- 8367 ▣ ATM & Plus Pack Bundle 169
- 7392 ▣ Adobe PostScript Cartridge (with choice of FREE Type Cartridge 1 or Type Cartridge 2) 299
(Entire Adobe Type Library, from 1 to 230 is available. Call for more information.)

Aldus ... NCP

- 8000 □ Persuasion 2.0 for Windows 359
- 1332 □ PageMaker 4.0 549.

Application Techniques ... NCP

- 1214 ▣ Pizazz Plus 2.0 69.
- 9621 ▣ Picture Ease 1.0 for Windows 99

Artisoft ... NCP

- 2455 Lantastic EtherNet Starter Kit (includes software, 2 EtherNet cards, cable) 495
- 2452 EtherNet Adapter Card 209.
- 2454 EtherNet Microchannel Starter Kit 649.

Ashton-Tate ... NCP

- 4450 □ dBASE IV 1.1 499.

Atech Software ... NCP

- 9436 □ Publisher's Powerpak 1.2 for Windows 49
- 9435 □ Publisher's Powerpak 2.1 for WordPerfect & Microsoft Word 49.



Corel Systems ... NCP

5506 □ CorelDRAW! 2.0—The PC graphics software that's fast, fun and powerful. CorelDRAW! 2.0 now comes with more drawing power, more type control, and more value...and it's still easy to use \$389.

Automap ... NCP

- 2729 □ Automap 1.0 552.

Avery Dennison ... NCP

- 6006 ▣ Label Pro 1.0 (Laser) 49.
- 7336 ▣ Label Pro 1.0 for Dot Matrix 49.
- 1600 Avery 1st Impression 229.

Banner Blue Software ... NCP

- 3322 ▣ Family Tree Maker 2.0 45.
- 3324 ▣ Org Plus Advanced 6.0 65.

Berkeley Systems ... NCP

- 9885 ▣ After Dark 1.0A for Windows 29

Bitstream ... NCP

- 7568 ▣ FaceLift 1.2 for Windows 2 x/3 0 59.
- 8040 ▣ FaceLift 1.5 for WordPerfect 5.0/5.1 59.
- 7569 ▣ Companion Value Pack 1.0 125.
- 8883 ▣ Type City Cartridge with Deli 259.
- ▣ Typeface Packages each 89.

Borland International ... NCP

- 6242 ▣ Quattro Pro 3.0 339.
- 9695 □ Borland's C++ 2.0 339.
- 1514 ▣ Paradox 3.5 529.
- 7356 □ Pascal Pro (2nd Edition) 209.
- 9635 ▣ Object Vision 1.0 call

Broderbund ... NCP

- 1434 ▣ New Print Shop 39.

ButtonWare ... NCP

- 3613 ▣ TakeNote 1.0 for Windows 49
- 6419 ▣ PC-File 6.0 89.



Bitstream ... NCP

Fast and easy to use, FaceLift scales printer fonts to any size. FaceLift for WordPerfect 1.5 now includes 16 typefaces and provides dot matrix support.

- 8040 ▣ FaceLift 1.5 for WordPerfect 5.0/5.1 \$59.

Caere ... NCP

- 8933 ▣ Omnipage Professional 1.0 669

Central Point ... NCP

- 5039 □ PC Tools 7.1 115.
- 8114 ▣ Backup 7.0 (DOS and Windows) 84
- 1675 ▣ Commute 1.0 84
- 9751 ▣ AntiVirus 1.0 84.

Chipssoft ... NCP

- 1663 ▣ Turbo Tax Personal 1040 for DOS 9.0 49.
- 3517 ▣ Turbo Tax Personal 1040 for Windows 2.0 59
- State Tax Packages
- DOS ver. . . ea. 38.
- Windows ver. . . ea. 49

Chronologic Corporation ... NCP

- 8849 ▣ Instant Recall 1.2 64.

CompuServe ... NCP

- 7546 ▣ DOS Membership Kit 1.3 29.

Concentric Data Systems ... NCP

- 6575 ▣ R & R Relational Report Writer 4.0 159.

Corel Systems ... NCP

- 5506 □ CorelDRAW! 2.0 389

DAC Easy ... NCP

- 1748 ▣ Accounting 4.2 99.
- 1751 ▣ Bonus Pack 4.2 135.

Data Storm ... NCP

- 4798 ▣ PROCMM PLUS 2.01 69.

Delrina Technology ... NCP

- 2446 ▣ WinFaxPro 2.0 75.
- 7351 ▣ PerFORMPRO 1.0 179

Digital Research ... NCP

- 8288 □ DR DOS 6.0 69.



Berkeley Systems ... NCP

9885 ▣ After Dark 1.0A for Windows—Prevent screen burn-in with over 35 incredible displays—Aquatic Realm, Flying Toasters, Logo, Messages, Multimodule or create your own. Features DOS blanking, password protection & SOUND! \$29.

Fifth Generation Systems ... NCP

- 7725 ▣ Direct Access 5.1 65.
- 3950 ▣ Fastback Plus 3.0 119.
- 7795 ▣ Disklock 1.0 119.

Fox Software ... NCP

- 6188 ▣ FoxPro 2.0 489.

Funk Software ... NCP

- 9488 ▣ Sideways 3.3 & P.D. Queue 1.0 85.

Geoworks ... NCP

- 8789 ▣ Ensemble 1.2 129.

Gibson Research ... NCP

- 9832 ▣ SpinRite II 2.0 64.

Great American Software ... NCP

- 9827 ▣ Money Matters 2.0 & Payroll 2.0 99.

- 4880 □ One Write Plus Acct. Sys. 2.06 189.

Hayes ... NCP

- 7983 ▣ Smartcom Exec 2.0 75.

- 9639 ▣ LANstep 1.0 349.

hDC Computer Corporation ... NCP

- 8974 ▣ Icon Designer 1.0 35

Helix Software ... NCP

- 9627 ▣ Netroom 2.0 (single user) 52.

Hilgraeve ... NCP

- 8204 ▣ HyperACCESS/5.2.0 (DOS) 59.

IBM ... NCP

- 2666 □ DOS 5.0 Upgrade 59.

Individual Software ... NCP

- 1328 ▣ Professor Windows 1.0 27

- 6222 ▣ Resume Maker 1.3 29.

Inset Systems ... NCP

- 7298 ▣ Hijaak 2.1 99.

- 7300 ▣ Inset Plus Hijaak 125.



Inset Systems ... NCP

7298 ▣ Hijaak 2.1—Capture screens & convert graphics files with Hijaak release 2.1. New features include 5K pop-up window, many new raster & vector formats and support for more than 25 Group 3 fax devices \$99.

of crowded malls?



Teleware ... NCP

4341 • **MYOB for Windows**—Incredible Accounting Software for Windows. M.Y.O.B. contains full-featured G/L, A/R, A/P, Inventory and Card file. The hottest selling program for the Mac is now available for PC users. \$139.

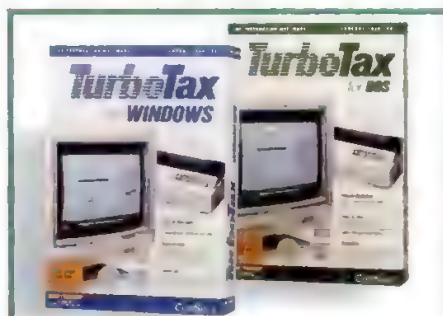
8320	Inslght Development ... NCP	
	□PnnTools 1.0	85.
	Intuit ... NCP	
2426	□Quicken 4.0	39.
2474	□Quicken with QuickPay	65.
	LaserTools ... NCP	
6882	□PrintCache 2.4	99.
2656	□Printer Control Panel 2.2	99.
2801	□Fonts-on-the-Fly 1.0 (WordPerfect 5.1/5.0)	99.
	Lotus ... NCP	
5417	□1-2-3 3.1 Plus	429.
5653	□1-2-3 2.3	349.
1852	□1-2-3 2.3 Upgrade	95.
2755	□1-2-3 for Windows 1.0	419.
2747	□1-2 3/W and Ami Pro Upgrade	159.
5799	□Ami Pro 2.0	309.
1847	□Ami Pro Competitive Upgrade	119.
1621	□Freelance Graphics 4.0 for DOS	349.
2750	□cc:mail DOS Platform Pack	125.
2748	□cc:mail Windows Platform Pack	325.
2749	□cc:mail 25 user Pack	379.
	MacroMind ... NCP	
3484	Action! 1.0 (3 1/2" only)	349.
	M-USA Business Systems ... NCP	
3408	□Pacioli 2000 (Accounting software)	29.



MacroMind ... NCP

3484 **Action! 1.0**—Create dazzling multimedia presentations. Purchase between 11/1/91 and 12/31/91, send in your registration card along with a dated sales receipt and receive a \$100 rebate directly from MacroMind. \$349.

	MECA ... NCP	
2798	□Managing Your Money 7.0	\$99.
4603	□Andrew Tobias' Tax Cut 1991	49.
	Micro Logic ... NCP	
6787	□Info Select 2.0	95.
	Microcom ... NCP	
7649	□Virex-PC 2.0	79.
6234	□CarbonCopy Plus 6.0	119.
2718	□Relay Gold for Windows	239.
	Microlytics ... NCP	
9636	□Strunk & White Elements of Style 1.0	35.
7931	□Random House Encyclopedia 1.0	68.
	Microsoft ... NCP	
3338	□Money 1.0 for Windows	49.
2894	□QuickBasic 4.5	69.
7010	□Windows 3.0	99.
7388	□Project 1.0 for Windows	459.
2904	□Works 2.0	99.
2735	□Works 1.0 for Windows	139.
3337	□Publisher 1.0 for Windows	139.
2901	□Word 5.5	209.
7387	□PowerPoint 2.0 for Windows	329.
6195	□Word 1.1 for Windows	329.
2856	□Excel 3.0 for Windows	329.
8137	□Office 1.6 for Windows	499.
2853	□C Compiler 6.0	329.
1620	□DOS 5.0 Upgrade	65.
1624	□Visual Basic 1.0	139.



Chipsoft ... NCP

1663 • **Turbo Tax Personal 1991 for 1991** (Headstart edition)—Everything you need; features over 80 forms, schedules & worksheets plus a tax planning module. Prints IRS-approved returns. Windows version & state packages avail. \$49.

	Multisoft ... NCP	
4925	□PC-Kwik Power Pack 2.1	75.
	Nolo Press ... NCP	
5122	□For The Record 2.0	35.
2982	□WillMaker 4.0	39.
	Norton-Lambert ... NCP	
2753	□CloseUp for Windows & DOS Dual Pack	129.
	OCR Systems ... NCP	
9878	□ReadRight 3.0 for Windows	309.
	Okna ... NCP	
9696	□Desktop Set 3.0 for Windows	85.
	PC Globe ... NCP	
5902	□PC Globe 4.0	45.
5900	□PC USA 2.0	45.

1-800/800-0004

MMC PC Connection 910M
6 Mill Street
Marlow, NH 03456
SALES 603/446-7721 FAX 603/446-7791

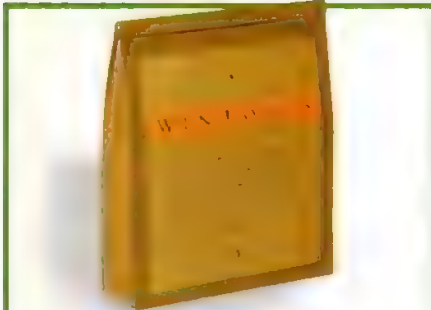


Lotus ... NCP

2747 • **1-2-3 for Windows & Ami Pro 2.0 "Double Up" Upgrade**—Upgrade from any PC release of 1-2-3 or any Lotus word processor to both 1-2-3 for Windows and Ami Pro 2.0! Available through 12/31/91. \$159.

	Personics ... NCP	
9288	Laptop Ultravision 2.1 (3 1/2" only)	49.
4384	□Ultravision 2.0	79.
	PowerUp! ... NCP	
7860	□Calendar Creator Plus 4.0	52.
7857	□Labels Unlimited 3.0	49.
7858	□Express Publisher 2.0	99.
7311	□Form Publisher for Windows w/Fill & File	195.
	Qualitas ... NCP	
7539	□386MAX 5.12 (w/ASQ)	75.
7967	□BlueMAX 5.12 for PS/2 (3 1/2" only) (w/ASQ)	85.
	Quardeck ... NCP	
3221	□Expanded Memory Mgr. 386 6.0	65.
3220	□DESVIEW 2.4	85.
4586	□DESVIEW 386 2.4	145.
	QUE Software ... NCP	
4155	□RightWriter 4.0	54.
1857	□RightWriter 4.0 Network	165.
	Reality Technologies ... NCP	
7891	□WealthStarter 2.0 w/Charles J. Givens	39.
6572	□WealthBuilder 1.1	99.
	Reference Software ... NCP	
4396	□Grammatik IV 2.0	59.
7483	□Grammatik for Windows 2.0	59.
	Roykore ... NCP	
2473	□Instant ORG Charting! 1.0	125.
8162	□ABC Flowchart 1.1	189.
	Sitka ... NCP	
6675	□TOPS Network Bundle 3.0	159.
3720	Flashcard 2.1 (AppleTalk network card)	155.
	Softlogic Solutions ... NCP	
3542	□Software Carousel 5.0	55.
	Software Publishing ... NCP	
3496	□Professional Write 2.2	169.
9638	□Professional Write Plus 1.0	169.
3482	□Harvard Graphics 3.0	419.
6600	□Superbase 4 for Windows 1.3	529.
	Software Toolworks ... NCP	
9859	□Word for Word 4.2 for Windows	47.
3290	□Desk Reference Library	45.
	Solution Systems ... NCP	
7977	□Brief 3.1 (Programmer's Editor)	189.
	Spinnaker ... NCP	
1415	□PFS: WindowWorks 1.0	129.
7604	□PLUS for Windows 2.0	289.
	Stac Electronics ... NCP	
1409	□Stacker 2.0	89.
	Symantec ... NCP	
6397	□The Norton Backup 1.2 (Windows/DOS)	89.
3146	□The Norton Utilities 6.0	119.
3425	□Q&A 4.0	269.

Park at your phone



Tool Technology ... NCP
3363 WinTools 1.0 for Windows—Full object oriented. Customize with Image Librarian's 100 icons. Automate your work with icons that run programs and Big Sky's sixteen virtual screens (3 1/2" only) \$125.

7999	□ Norton Anti-Virus 1.5	89
2359	□ The Norton Desktop 1.0 for Windows	105
8378	□ PC Anywhere IV 4.03	125
Systems Compatibility ... NCP		
9046	□ Complete Writer's Toolkit 1.1	85
6564	□ Software Bridge 5.0	79
Teleware ... NCP		
9847	□ M.Y.O.B. for Windows	139
TIMESLIPS ... NCP		
2987	□ Timeslips III 4.0	195
1270	□ TimeSheet Pro 2.0	135
Timeworks ... NCP		
6253	□ Publish-It! 2.0	159
Tool Technology ... NCP		
3863	□ WinTools for Windows 1.0 (3 1/2" only)	125
Touchstone Software ... NCP		
7420	□ Check It 3.0	89
Traveling Software ... NCP		
5179	□ LapLink III 3.0	95
Ventura ... NCP		
7796	□ Publisher V 4.0 for Windows	569
WordPerfect Corporation ... NCP		
7781	□ LetterPerfect 1.0	129
4214	□ WordPerfect Office PC	89
3804	□ WordPerfect 5.1	265
WordStar International ... NCP		
1482	□ Correct Grammar 1.0 for Windows	65
6791	□ WordStar Professional 6.0	199
XTREE ... NCP		
6161	□ XTree Gold 2.5	95
Z-Soft ... NCP		
1826	□ Publisher's Paintbrush for Windows	299



Abracadata ... NCP
3629 Design Your Own Home-Architecture 3.0—Draw floor plans & structural details ... \$63.
3631 Design Your Own Home-Interiors 1.0—Draw room plans, arrange furniture & more 63.
3638 Design Your Own Home-Landscapes 1.0—Create complete landscape plans. 63.

RECREATIONAL/EDUCATIONAL

Abracadata ... NCP		
3629	□ Design Your Own Home-Architecture 3.0	\$63.
3631	□ Design Your Own Home-Interiors 1.0	63.
3638	□ Design Your Own Home-Landscapes 1.0	63
Broderbund ... CP		
8068	□ Where in World is Carmen Deluxe	52.
1836	□ Where in America's Past is Carmen Sandiego	39.
5851	□ SimCity	33.
8886	□ SimEarth	45.
Electronic Arts ... NCP		
4534	□ Mavis Beacon Teaches Typing 2.0 (CP)	35.
3031	□ Mavis Beacon for Windows	45.
3023	□ ChessMaster 3000	35.
7865	□ PGA Golf	35.
1334	□ Chuck Yeager Air Combat Trainer	42.
7372	□ World Atlas 2.0	42.
3050	□ World Atlas for Windows	57
Harvard Associates ... NCP		
2324	□ PC Logo 3.0	59.
HyperGlot Software ... NCP		
(French, German, Italian, Spanish available.)		
	□ Word Torture for Windows	ea. 34
	□ Word Torture 3.0	ea. 29.



Knowledge Adventure ... NCP
3861 Knowledge Adventure 1.0—Chart your own course of discovery through science, art, literature, music, geography. Needs only hard disk and EGA/VGA to access rich image/text base. For kids and adults! \$65.

Knowledge Adventure ... NCP		
3861	□ Knowledge Adventure 1.0	65.
Microsoft ... NCP		
7881	□ Entertainment Pack for Windows 1.0	29.
2858	□ Flight Simulator 4.0	39.
8270	□ Aircraft and Scenery Designer 1.0	29.
Microsoft Press (Books)		
8129	Running Windows (2nd Edition)	22.
Penton Overseas ... NCP		
□ Vocabulary Levels I & II (French, Italian, German, Spanish, Russian, Hebrew and Japanese) each 35.		
Sierra ... CP		
2767	□ Leisure Suit Larry V (VGA)	39.
9466	□ Space Quest IV (VGA)	39.
7972	□ King's Quest V (VGA)	45.
Software Toolworks ... NCP		
3294	□ Game Pak (5 games in one)	32.
9860	□ Word for Word Professional 4.2	89.
Spectrum Holobyte ... NCP		
3047	□ Wordtris	27.
3457	□ Falcon 3.0	45.
Stone & Associates ... NCP		
3435	□ Letters, Numbers, Words	22.
3439	□ 2nd Math 4.2	27.
Toyogo ... NCP		
2701	□ Go Master 5.0 for Windows	39
2703	□ Nemesis Deluxe Toolkit 5.0	75.
2704	□ Nemesis Deluxe Toolkit 5.0 for Windows	75
True BASIC, Inc. ... NCP		
□ Kemeny/Kurtz Math Series each 45.		



Practical Peripherals ... 5 years
2264 PM2400FX96 Fax Modem—2400 bps internal modem with true 9600 bps send/receive capabilities. A Hayes compatible 1/2 card, it also allows you to receive faxes in the background, & includes QuickLink II. . \$145.

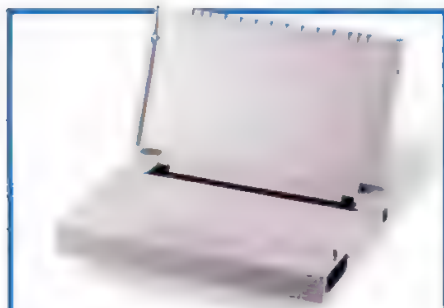
Walt Disney Computer Software ... CP		
2629	□ Mickey's 123's	35.
2624	□ Mickey's ABC's	35

HARDWARE

Warranties listed next to manufacturer.

American Power ... 2 years			
7108	Smart UPS 400	339.	
7105	Smart UPS 600	469.	
6811	Back-UPS 360	185.	
7106	Back-UPS 520	299.	
ATI Technologies ... 2 years			
9821	VGA Basic-16 (640 x 480, 16 colors)	69.	
2706	VGA Wonder XL (w/1 MB)	239.	
9985	VGA Integra (1024 x 768, 16 colors)	95.	
2382	Graphics Vantage VGA (w/1 MB)	359.	
9822	Graphics Ultra (w/1 MB)	559.	
2012	Graphics Ultra w/VGA (w/1 MB)	619.	
1825	2400etc/i Modem (w/9600 SendFax)	139.	
9620	9600etc/e Modem	379.	
3080	Stereo•F/X	149.	
3076	VGA Stereo•F/X (w/512K, upgrd. to 1 MB)	329.	
Boca Research ... 5 years			
7001	BOCARAM/AT PLUS (OK)	119.	
7150	BOCARAM/AT PLUS (2 MB)	219.	
7139	(4 MB)	329. 7138 (8 MB)	539.
6998	I/O Board for AT	55.	
6999	I/O Board for Microchannel (S/S/P)	109.	
8380	BasicVGA (256K, 640 x 480)	63.	
8381	SuperVGA (1 MB, 1024 x 768)	145.	
3859	2400 Internal Modem	85.	
3860	2400 External Modem	109.	
Bravo Communications ... 2 years			
7400	2 Position Laser Compatible Switch Box	109.	
Brown-Wagh ... 1 year			
8578	Creative Labs Sound Blaster	115.	
2336	Creative Labs Sound Blaster Pro	189.	
Caere ... 1 year			
8158	Typist Plus Graphics	389.	
Canon ... 1 year			
We are an authorized Canon Service Center.			
7894	BJ-10ex Printer (4.6 lb.)	339.	
7897	BubbleJet Ink Cartridge (BJ-10ex)	23.	
7896	BJ-10ex Sheet Feeder	75.	
Cardinal ... 1 year			
2720	MB2450 Internal 2400 Baud Modem	69.	
2719	MB2296SR Internal Send/Receive Fax	109.	
2721	VGA732 True Color Ultra VGA Card	185.	
CH Products ... 1 year			
7801	FlightStick w/Falcon	49.	
CoStar ... 1 year			
1418	AddressWriter Envelope Printer	499.	
Curtis ... lifetime			
1708	Ruby-Plus SPF-2+	65.	
7358	Command Center SPF-4	89.	
	Glass Filter Plus (specify size)	each 65.	

and give us a call.



Canon ... 1 year

7894 BJ-10ex Printer—New enhanced version of the popular 4.6 lb. printer provides laser-like print quality (up to 360 dpi) on plain bond paper, envelopes or transparencies. Available in white or gray \$339.

Cyrix Corporation ... 5 years

MATH COPROCESSORS

9875	FasMath 83D87-25	185.
9876	FasMath 83D87-33	195.
9877	FasMath 83S87-16 (SX compatible)	115.

Datadesk ... 3 years

6901	Switchboard (modular keyboard)	159.
------	--------------------------------	------

Epson ... 2 years

We are an authorized Epson Service Center.

1906	FX-850 (80 col., 264 cps, 9 pin)	319.
1904	FX-1050 (136 col., 264 cps, 9 pin)	449.
2358	LQ-570 (80 col., 252 cps)	289.
2361	LQ-870 (80 col., 330 cps)	489.
2357	LQ-1170 (136 col., 330 cps)	669.
5184	LX-810 (80 col., 180 cps, 9 pin)	185.

Everex ... 1 year

1683	Tempo LX Notebook (5 MB, 60 MB HD)	2899.
------	------------------------------------	-------

Hauppauge Computer ... 1 year

9870	25 MHz 386N Motherboard for AT	899.
9034	33 MHz 386N Motherboard for AT	979.

Hayes ... 2 years

7391	Ultra 96 Modem	669.
3522	OPTIMA 96	479.
9884	Pocket Edition 2400	125.

Hewlett-Packard ... 1 year

9993	LaserJet IIP (with toner)	1149.
6754	LaserJet III (with toner)	1679.

Hitachi ... 2 years

9492	14MVX/LMF 14" SVGA Monitor (1024 x 768) (with low radiation screen)	489.
------	---	------

Intel ... 5 years

3864	1.44EX Modem	549.
6421	2400B MNP Internal Modem	189.
6420	2400EX MNP Modem	225.
7880	9600EX Modem	499.
2346	Inboard 386/PC with 1 MB	495.
5336	Above Board Plus 8 2 MB	449.
5342	Above Board Plus 8 I/O 2 MB	479.
7782	SatisFAXtion (fax board)	389.
8778	SatisFAXtion for Microchannel	449.
8903	Matched Memory 4 MB (PS/2)	299.
	Matched Memory (for LaserJet IIP, III, IIP/III)	
1810	1 MB	99.
1637	Snap-In 386	389.
3358	Power Pak (Snap-In 386 & Above Board Microchannel 4 MB)	925.

MATH COPROCESSORS

7385	80287XL (16 MHz 80286 CPU's)	89.
4750	80387SX (16 MHz 80386SX CPU's)	129.
6830	80387SX-20 (20 MHz 80386SX CPU's)	145.
5409	80387-33 (80386DX CPU's)	219.

Kensington Microware ... 1 year

2582	Master Piece Plus	\$99.
7899	Expert Mouse serial	119.
3312	LaserStand	125.
3311	MasterStand	59.

Keytronic ... 3 years

4518	101 Plus Keyboard	99.
------	-------------------	-----

Kraft ... 5 years

5801	Game Card (2 ports)	27.
5813	Game Card w/Thunderstick	49.
5800	3 button Thunder Joystick	29.
7862	TopTrak (Laptop Trackball)	55.

Logitech ... limited lifetime

6029	Trackman serial	75.
	6028 bus	79.
2343	Trackman Portable	105.
1484	ScanMan 32	169.
7975	ScanMan 256	289.
3295	MouseMan (combo)	75.
	9766 (cordless)	89.

Megahertz ... 5 years

1193	T324D 2400 Modem (for Toshiba Laptops)	129.
1196	T224 2400 Modem (for Toshiba Laptops)	129.
1187	T324FM 96/24 Fax Modem (Toshiba Laptops)	299.
1199	T52CC - 2 MB Upgrade for Toshiba T1000 series or T2000SX	239.

Micron Technology ... 2 years

7595	2 MB Expansion for HP LaserJet IIP or III	119.
7012	Memory Upgrade PS/2 70 - 2 MB	139.



Hayes ... 2 years

3522 OPTIMA 96—Get Hayes performance and reliability at a terrific price! Supports V.32 9600 bps operation with V.42bis data compression for speeds up to 38,400 bps \$479.

Microsoft ... lifetime

7597	Microsoft Mouse (bus or serial)	89.
2897	Mouse with Paintbrush (bus or serial)	105.
2898	Mouse with Windows 3.0 (bus or serial)	149.
1956	Mouse with Works (bus or serial)	155.
1896	Ballpoint Mouse (serial only)	119.

MicroSpeed ... 1 year

2763	MicroTRAC (serial & PS/2 interface)	59.
	PC-TRAC Trackball	
6007	serial	75.
	6008 bus	89.
7271	Inport	79.
	6330 PS/2	79.

Mouse Systems ... lifetime

5997	Trackball (1 yr. warranty) serial	65.
	bus	69.
3213	PC Trackball II (serial)	69.
7878	PC Mouse III (serial)	89.
	bus	95.

1-800/800-0004

MMC
Marlow Marketing Company

PC Connection

6 Mill Street
Marlow, NH 03456

910M

SALES 603/446-7721 FAX 603/446-7791



TIMESLIPS ... NCP

2987 Timeslips III 4.0—Know exactly who owes you what with this time and expense billing system. Perfect for service professionals (accountants, lawyers, etc.) who need to track and bill their time \$195.

NEC ... 2 years

9441	CDR36 Portable CD-ROM Drive	399.
4799	Multisync 2A (VGA Monitor)	439.
5085	Multisync 3Ds Monitor	619.

Orchid Technology ... 4 years

7863	ProDesigner VGA IIS (with 1 MB, includes RAMDAC chip)	249.
------	---	------

PC Power & Cooling ... 1 year

REPLACEMENT POWER SUPPLIES

3203	Turbo Cool 200	149.
7915	Turbo Cool 300	165.

Pacific Data Products ... lifetime

6779	25 Cartridges in One! (for LJ II, IIP, III)	275.
2255	Fontbank (0.75 MB)	225.
3491	Fontbank (1.5 MB)	299.
8975	Complete Font Library (for LJ III)	275.
	Memory upgrade for LaserJet IIP/III:	
7055	2 MB	149.
	7759 4 MB	259.
	Memory upgrade for LaserJet IIP/III:	
6838	2 MB	249.
	6836 4 MB	379.
8091	Pacific Connect with 256K	275.
8090	Pacific Connect with 1.25 MB	349.
7158	Pacific Page PE 4.1 (for LJ IIP/III)	379.
6834	Pacific Page (for LJ II) w/2 MB Mem. Brd.	379.
9833	Pacific Page XL (w/accelerator board)	799.



Microcom ... NCP

7649 Virex-PC 2.0—Powerful, comprehensive solution to DOS-based computer viruses. Featuring: MiniScan TSR for continuous virus protection, Windows & Network compatible, less than 1K & detects over 450 viruses \$79.

PC CONNECTION®

© COPYRIGHT PC CONNECTION, INC. 1991. PC CONNECTION, PCTV AND THE RACCOON CHARACTERS ARE REGISTERED TRADEMARKS OF PC CONNECTION, INC., MARLOW, NH. ALL OTHER TRADEMARKS REMAIN THE PROPERTY OF THEIR RESPECTIVE COMPANIES.

No hustle or hassle.

Practical Peripherals ... 5 years

3103	2400 Baud Internal Modem	\$85.
3102	2400 Baud External Modem	179.
8993	2400 Baud Internal Modem (V.42 bis)	169.
8994	2400 Baud External Modem (V.42 bis)	199.
4542	2400 Baud Internal Modem for PS/2	229.
8132	PM2400 Pocket Modem	109.
2266	PM9600 Internal Modem	399.
7934	PM9600SA Modem	469.
2264	PM2400FX96 (modem/fax board)	145.

Targus ... lifetime

1305	Universal Notebook (for ntbk. computers)	69.
TheComplete PC ... 2 years		
8082	Half Page Scanner/400 w/ReadRight	289.
5828	TheComplete Communicator	319.

Toshiba ... 1 year

3359	T2000SX Notebook (60 MB)	3299.
3360	T2000SX Notebook (40 MB)	3399.
3361	T2000SX Notebook (60 MB)	3649.
1779	T3100SX Laptop (80 MB)	3199.
1773	T3200SX Laptop (120 MB)	3499.

Tripp Lite ... 2 years

6199	Isobar 4-6 (4 outlets, Gold Seal Warranty)	49.
6200	Isobar 6-6 (6 outlets, Gold Seal Warranty)	59.
6201	Isobar 8-12 (8 outlets, Gold Seal Warranty)	69.
6018	LC1200 (1200W line conditioner)	159.
1528	PS6.0 (600VA on-line UPS)	559.

Video 7 ... 7 years

9768	VRAM II VGA 1 MB	329.
------	------------------	------

Zoom Telephonics ... 7 years

1307	Int. 2400 Baud w/9600 Baud Fax Modem	109.
1178	Ext. 2400 Baud w/9600 Baud Fax Modem	119.
1170	2400 Baud w/4800 Baud sendfax	69.
1181	2400 Baud V.42bis Modem (2 year)	129.
1167	2400 Baud Internal Modem	65.
1166	2400 Baud External Modem	75.
3075	9600 V.32 Turbo Internal Modem (2 yr.)	399.



IOMEGA ... 1 year

2224 Bernoulli II Transportable 90 MB—Rugged and built to last, this drive will absorb 1000 g's of shock and provide 90 MB of portable storage. Awards from Byte and InfoWorld. Requires adapter card \$799.

DRIVES

Conner Peripherals ... 1 year

8875	CP3044 40 MB IDE HD (25 ms)	219.
2339	CP30104 120 MB IDE HD (19 ms)	399.
1337	CP3204 200 MB IDE HD (16 ms)	629.

IOMEGA ... 1 year

We are an authorized Iomega Service Center.

2224	Bernoulli II Transportable 90 MB	799.
2616	Internal 90 MB Bernoulli	799.
2500	PC2B Controller	199.
2530	90 MB Cartridge	149.
2467	90 MB Cartridge Tripak	439.

Mountain Network Solutions ... 2 years

2917	40-60 MB Internal Tape Drive	259.
5190	DC2000 Pre-formatted Cartridges	ea. 35.
6153	DC2120 Tape Cartridge (5 pack)	149.

Pacific Rim ... 1 year

1304	1.2 MB External (for any parallel port)	239.
8602	1.44 MB External (for PC/XT/AT)	239.

Plus Development ... 2 years

8304	Hardcard II XL 50 MB (9 ms)	\$399.
8287	Hardcard II XL 105 MB (9 ms)	599.

Seagate ... 1 year

4554	40 MB Internal HD ST251-1 (28 ms)	249.
1321	ST157A 40 MB IDE Hard Drive	229.
1320	ST1144A 130 MB IDE Hard Drive	459.

TEAC ... 1 year

4670	1.44 MB Drive for PC/XT (3 1/2")	69.
4326	1.44 MB Drive for AT (3 1/2", w/Basetech)	89.
4951	720k Drive for PC/XT (3 1/2")	69.
6951	1.2 MB Drive for AT (5 1/4")	75.

MEMORY

6556	256k DRAM (100 ns, set of 9)	call
5510	1 MB x 9 SIMMs (80 nanosecond)	call
2497	4 MB x 9 SIMMs (80 nanosecond)	call
5746	1 MB Chips (80 ns, set of 9)	call
7813	256K x 4 Chips	call



Boca Research ... 5 years

Fast & affordable, these modems provide many powerful features—at pleasantly surprising prices. Both are backed by a 5 year warranty.

3860	2400 External Modem	\$109.
3859	2400 Internal Modem	85.



Quarterdeck ... NCP

3221 Expanded Memory Manager 386 6.0—Gain up to 200K or more of previously unusable memory. Incl. automatic memory conversion, full compatibility with Windows, & speed optimization of memory (w/Manifest). .. \$65.

DISKS/MEDIA

Maxell ... lifetime

2790	5 1/4" MD2-D 1.2 MB Diskettes (Qty. 10)	15.
2792	3 1/2" DS/DD 720k Diskettes (Qty. 10)	13.
2793	3 1/2" DS/HD 1.44MB Diskettes (Qty. 10)	21.

Sony ... lifetime

3291	5 1/4" DS/DD 360k Disks (Qty. 10)	8.
3297	3 1/2" DS/DD 720k Diskettes (Qty. 10)	11.
3298	3 1/2" DS/HD 1.44 MB Diskettes (Qty. 10)	18.
6148	3 1/2" DS/DD (3 Pack)	29.

6375	3 1/2" DS/HD (3 Pack)	\$49.
8185	QD2040 Tape Cartridge	19.
1895	QD2120 Tape Cartridge	22.
6715	QD6150 Tape Cartridge	27.
3M ... lifetime		
3943	DC 2000 Tape Cartridge	19.
6065	DC 2080 Tape Cartridge	25.
3944	DC 600 Tape Cartridge	29.
5679	DC 6150 Tape Cartridge	29.

OUR POLICY

- We accept VISA and MASTERCARD only.
- No surcharge added for credit card orders.
- Your card is not charged until we ship.
- If we must ship a partial order, we never charge freight on the shipment(s) that complete the order (in the U.S.).
- No sales tax, except Ohio residents (please add applicable tax).
- All U.S. shipments insured; no additional charge.
- APO/FPO orders shipped 1st Class Mail.
- International orders U.S. \$250 minimum. Manufacturer support and upgrade eligibility may be limited outside the U.S.A.
- Upon receipt and approval, personal and company checks clear the same day for immediate shipment of your order.
- COD max. \$1000. Cash, cashier's check, or money order.
- 120 day limited warranty on all products. Defective software replaced immediately. Defective hardware repaired or replaced at our discretion. All items subject to availability. Prices and promotions subject to change without notice.
- To order, call us Monday through Friday 8:00 a.m. to 1:00 a.m., or Saturday 9:00 a.m. to 5:30 p.m. Eastern Time. You can call our business offices at 603/446-3383 Monday through Friday 8:00 a.m. to 5:30 p.m.



Intel ... 5 years

3864 14.4EX Modem—Intel's fastest modem! Features 14.4Kbs throughput (up to 57.6Kbs with compression). 16 MHz 80188 automatic error correction with Trellis Coded Modulation, and automatic speed optimization \$549.

SHIPPING

Note: Accounts on net terms pay actual shipping.

Continental US:

- For heavy hardware items such as printers, monitors, Bernoulli Boxes, etc. pay actual charges. Call for UPS 2nd-Day & Next-Day-Air.
- For all other items, add \$3 per order to cover UPS Shipping. For such items, we automatically use Airborne Express at no extra charge if you are more than 2 days from us by UPS ground.

Hawaii:

- For monitors, printers, Bernoulli Boxes, computers, hard drives, and power backups, actual UPS Blue charge will be added. For all other items, add \$3 per order.

Alaska and outside Continental US:

- Call 603/446-7721 for information.



PC Cornucopia.

**Oh my gourd!
What will they think of next?**

It's time to preserve, pickle, and pack it in for the season up here in the glorified pumpkin patch of Marlow, NH (pop. 567). But even though there's a definite nip in the air, and we're tucking ourselves in tighter each night, we continue offering the freshest crop of PC products you'll find anywhere—not to mention service that's way more personal than any computer will ever be.

Our illustrious party animals have been adding a human touch to high tech for almost ten years now. But for newcomers it may be a little hard to see the Connection, so to speak. Well, it's simple—while we do have

the best combination of low prices, technical support, and fast shipping around, we're still just a bunch of country folk doing an honest day's (and often night's) work here in the woods of New Hampshire. Call anytime—whether you want the latest video display or a report on this year's apple crop.

A kernel of truth. (Or, let's not get too corny.)

Things will really start hopping around your office when you get your supply of PC Connection Popcorn on the Cob. We're sending some free to everyone who places an order for \$750 or more between now and December 31. Just put a cob in the bag, place it in your microwave, and out come three cups of popcorn. What an earful!

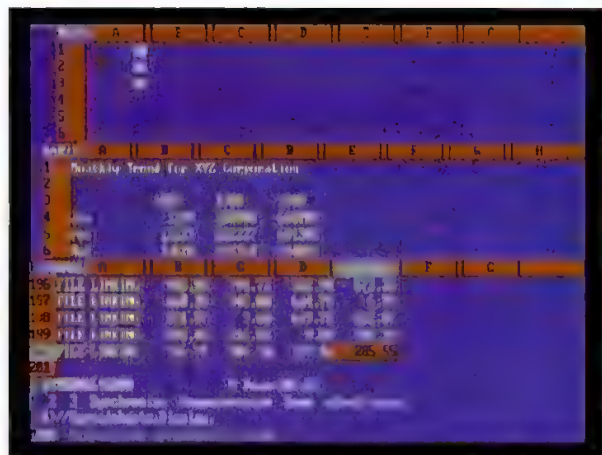


Lend you an ear? We'll give you 3 of them!
PC Connection Popcorn on the Cob. One batch per customer. Not available outside continental U.S.

PC CONNECTION®

COPYRIGHT PC CONNECTION, INC. 1991. PC CONNECTION AND THE RACCOON CHARACTER(S) ARE REGISTERED TRADEMARKS OF PC CONNECTION, INC. MARLOW, NH.

SOFTWARE SPREADSHEETS



CA-SuperCalc has the ability to load multiple spreadsheets in memory simultaneously and display as many as three worksheets at once.

Only three spreadsheets can be displayed at once in cascade fashion, but *CA-SuperCalc* lets you have as many as 255 sheets in memory at one time if your system memory allows it. Spreadsheets can have as many as 255 pages, and you can have a mixture of single-page and multipage worksheets in memory at the same time. Ranges can cross spreadsheets, both for formatting and for calculations, and multiple individual spreadsheets can be saved as a workgroup.

On a straight feature-by-feature comparison with its competitors, *CA-SuperCalc* fares well, coming out relatively high in all areas except presentation graphics and interoperability.

CA-SuperCalc is also loaded with 131 separate formula functions in many areas such as date and time and financial functions. Spreadsheet auditing is *CA-SuperCalc*'s strong point. The //T command or Alt-F1 key sequence gets you into Audit mode, which contains features for finding and displaying relationships, formats, values, and contents.

Data analysis via what-if tables, distribution tables, regression analysis, and matrix math are all available in *CA-SuperCalc*. There's no solver, but goal-seeking is possible using multiple cells and recalculation iterations. Data searching including search-and-replace is available, but there are so many query options that the interface gets in the way; this program screams for pop-up dialog boxes.

Data sorts are limited to three sort keys, a surprising limitation in a program that is generally strong on operation op-

tions. Data consolidation, a *SuperCalc* tradition, is very strong, with multiple sheets and cells able to be consolidated as well as linked to one cell.

UNIQUE CHART TYPES

Automatic charting features are few in *CA-SuperCalc*, but the varieties of chart types and options within charts are impressive. In addition to the usual business charts, you'll find radar charts and delta charts, the latter being most helpful in displaying relative

changes in values.

There is no WYSIWYG mode in *CA-SuperCalc*, and you can't combine worksheets and graphics on-screen or on paper. Multiple fonts are included, but printing reports and graphics is particularly cumbersome due to the program's menu structure and organization.

CA-SuperCalc has a strong macro language with procedures, subroutines, conditionals, and loops with both worksheet and file macros. It also contains a learn mode and macro command programming. Macro debugging via a trace mode and error trapping is augmented by the program's audit mode.

CA-SuperCalc's performance is generally average in comparison with the other programs evaluated here. Recalculation test scores were somewhat slow, even when significantly improved with a math coprocessor. The program had the slowest Link Refresh time (a process not speeded up with a math coprocessor), but in normal operations *CA-SuperCalc*'s response time is fine.

CA-SuperCalc is certainly a feature-rich program, but its menu structure needs work. While it's fine for people who have used previous versions of *SuperCalc*, Version 5.1's interface is too awkward for new users, and it doesn't compete

well with the better-looking spreadsheets and menu systems found in most graphics-mode products, even when those products often have fewer and less-powerful features. *CA-SuperCalc* may be a strong spreadsheet, but today user's are looking for more than just good number-crunching power.

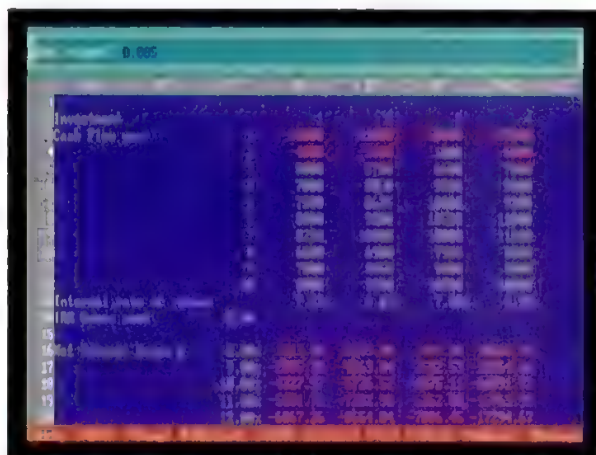


by Bruce Brown

You don't always need a huge, expensive program to get a job done well. FormalSoft's \$49 *InstaCalc*, Version 3.0, comes on just one floppy disk and is a fine value. It runs in either standalone or TSR mode, and when run as a TSR takes only 15K RAM. *InstaCalc* doesn't have all of the bells and whistles of *Microsoft Excel*, *Quattro Pro*, the *Lotus 1-2-3* DOS versions, or even *CA-SuperCalc* or *Wingz*, but it's a good text-mode spreadsheet that includes enough 1-2-3 compatibility to make it instantly usable by anyone with previous 1-2-3 experience.

An *InstaCalc* worksheet can have up to 256 columns and 4,096 rows. This row limitation (most programs have 8,192 or more) shouldn't be a problem in most common spreadsheet scenarios, but if you do need more rows, look elsewhere. You can link *InstaCalc* spreadsheets to external files on-disk, but you cannot exceed the row limitation. All worksheets are two-dimensional only, with no multipage spreadsheets.

InstaCalc can be set to a maximum 11 decimal places and has more than 100



InstaCalc's goalseeking function asks for three pieces of information: the dependent goal cell, the desired value, and the precedent cell.

GET J.K. LASSER'S YOUR INCOME TAX SOFTWARE AND SAVE A BUNDLE ON YOUR TAXES

**GET \$25 BACK
WHEN YOU BUY BEFORE
JANUARY 31st**

This year, be sure you don't pay a penny more in taxes than you have to.

Be positive you're taking advantage of every legal loophole and tax break you have coming to you. Be confident you've minimized your risk of audit.

All without paying a professional tax preparer.

Do it by using J.K. Lasser's Your Income Tax Software — the same software used by thousands of professionals.

The only software from America's leading tax experts.

With J.K. Lasser's Your Income Tax Software, you're plugging 55 years of tax expertise right into your PC. It's the only program keyed to the plain-English tax-saving strategies in the 500-page J.K. Lasser tax guide. A copy of this perennial bestseller is included FREE with your software.

A sophisticated program that's easy enough for a novice. Step by step, line by

line, J.K. Lasser's Your Income Tax Software leads you through the forms you need to file, advises you on tax strategy, takes advantage of every possible deduction and loophole, then double-checks its calculations with guaranteed accuracy.

You can prepare your own individual, small business, partnership or S corporation tax return with speed, accuracy and confidence that you're saving every dollar you possibly can.

Get a "Head Start" now and get a \$25 rebate. This year, let your PC do your tax paperwork while you reap the savings! Get our "Head Start" version 1.0 in your software or bookstore now and receive final version 1.1 FREE. Plus a \$25 rebate when you purchase your software after December 26th and mail the coupon below before January 31, 1992.

To order direct and save \$25 off the \$74.95 retail price, use your credit card and call 1-800-825-7638.

56163Z1(5)

AVAILABLE AT SOFTWARE ETC., WALDENS SOFTWARE, COMPUSA... AND SOFTWARE STORES NEAR YOU!

\$25 REBATE

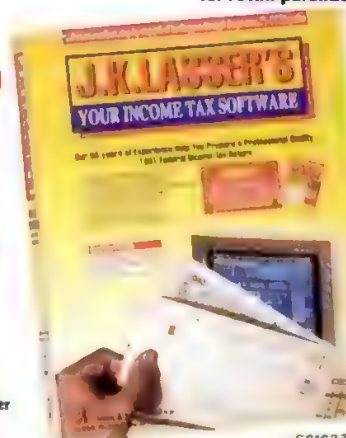
J.K. LASSER'S YOUR INCOME TAX SOFTWARE "HEAD START" EDITION 1.0

To receive your \$25 rebate:

- 1 Clip the UPC code from J.K. Lasser's Your Income Tax Software "Head Start Edition."
- 2 Complete the information below.
- 3 Mail this rebate certificate along with your UPC code and dated receipt of purchase with the price circled to:

J.K. Lasser's Rebate Offer
P.O. Box 1153
Grand Rapids, MN 55745-1153

Your name _____ (please print)
Address _____ Apt. _____
City _____ State _____ Zip _____



**Good 12/26/91 - 1/31/92
for retail purchases**

This rebate certificate must accompany your request. No duplications accepted. Offer good for retail purchases only in the U.S. while supplies last. Limit one rebate per family, group or organization. Void where prohibited, taxed or restricted. Allow 4 to 6 weeks for receipt of your rebate. Offer expires 1/31/92.

56163Z1(5)

SOFTWARE
SPREADSHEETS



SPREADSHEETS: SUMMARY OF FEATURES

Products listed in alphabetical order

	CA-SuperCalc	InstaCalc	Lotus 1-2-3 for DOS, Release 2.3	Lotus 1-2-3 for DOS, Release 3.1 Plus	Lotus 1-2-3 for Windows	Lucid 3-D	Microsoft Excel
List price	\$149.00	\$49.00	\$495.00	\$595.00	\$595.00	\$49.95	\$495.00
GENERAL INFORMATION							
Uses expanded memory	☒	☒	☒	☒	☒	☒	☒
Uses extended memory	☒	☒	☒	☒	☒	☒	☒
Uses virtual memory	☒	☒	☒	☒	☒	☒	☒
Disk space used for complete program	3.2MB	245K	5MB	6MB	7MB	550K	5.7MB
LAN version available	☒	☒	☒	☒	☒	☒	☒
OS/2 version available	☒	☒	☒	☒	☒	☒	☒
Macintosh version available	☒	☒	☒	☒	☒	☒	☒
HARDWARE							
Math coprocessor supported:							
8087	☒	☒	☒	☒	☒	☒	☒
80287	☒	☒	☒	☒	☒	☒	☒
80387	☒	☒	☒	☒	☒	☒	☒
Weitek	☒	☒	☒	☒	☒	☒	☒
Supports mouse	☒	☒	☒	☒	☒	☒	☒
Adapts to full-page monitors	☒	☒	☒	☒	☒	☒	☒
Can customize screen colors	☒	☒	☒	☒	☒	☒	☒
Can set conditional colors	☒	☒	☒	☒	☒	☒	☒
USER INTERFACE							
Menu structure:							
Lotus-style	☒	☒	☒	☒	☒	☒	☒
First-letter-sensitive	☒	☒	☒	☒	☒	☒	☒
Pull-down	☒	☒	☒	☒	☒	☒	☒
Customizable	☒	☒	☒	☒	☒	☒	☒
Workspace size:							
Maximum number of open files	Unlimited	Unlimited	1	256	Unlimited	Unlimited	Unlimited
Maximum number of columns per page	255	256	256	256	256	254	256
Maximum number of rows per page	9,999	4,096	8,192	8,192	8,192	9,999	16,384
Maximum column width (in characters)	127	70	240	240	240	254	255
SPREADSHEET FEATURES							
Maximum number of split screens	2	N/A	2	3	3	2	4
Formats screens independently	☒	☒	☒	☒	☒	☒	☒
Scrolls screens independently	☒	☒	☒	☒	☒	☒	☒
Undo	☒	☒	☒	☒	☒	☒	☒
Hidden rows/columns/cells	☒	☒	☒	☒	☒	☒	☒
Vertical/horizontal titles	☒	☒	☒	☒	☒	☒	☒
Automatic date-entry mode	☒	☒	☒	☒	☒	☒	☒
Automatic backup	☒	☒	☒	☒	☒	☒	☒
User-customizable backup interval	N/A	N/A	N/A	N/A	N/A	☒	☒
Backup can be disabled	N/A	N/A	N/A	N/A	N/A	☒	☒
Supports high-bit ASCII	☒	☒	☒	☒	☒	☒	☒
Extracts partial spreadsheets	☒	☒	☒	☒	☒	☒	☒
Provides file overwrite warning	☒	☒	☒	☒	☒	☒	☒
Allows user-selectable file extensions	☒	☒	☒	☒	☒	☒	☒
Allows nonalphanumeric characters in filename	☒	☒	☒	☒	☒	☒	☒
Displays formulas in worksheet	☒	☒	☒	☒	☒	☒	☒
Can cut and paste via Clipboard	☒	☒	☒	☒	☒	☒	☒
Allows programmable hotkeys	☒	☒	☒	☒	☒	☒	☒
Can lock macros/formulas	☒	☒	☒	☒	☒	☒	☒

☒—Editors' Choice

☒—Yes

☐—No

N/A—Not applicable: The product does not have this feature.

SOFTWARE SPREADSHEETS



InstaCalc, Version 3.0

FormalSoft, P.O. Box 1913, Sandy, UT 84091;
800-962-7118, 801-565-0971.

List Price: \$49.

Requires: 512K RAM, DOS 2.0 or later.

In Short: *InstaCalc*, Version 3.0, is a convenient standalone or TSR program that costs only \$49 and offers *Lotus 1-2-3* compatibility. It doesn't come with all of the fancy features found in the larger programs, and it can't open large spreadsheets, but it is a bargain.

CIRCLE 480 ON READER SERVICE CARD

built-in functions for use in formulas. There is limited help during formula construction; if you make an error the cursor appears on or close to the error in the edit line, but the problem isn't clearly displayed or explained. Spreadsheet auditing features are mixed, with a map of cell types and formulas and dependency tracing, but only one circular reference is displayed if your sheet has more than one present.

The program has a solver for single variable problems that's also easy to use, but it has no what-if table analysis and no regression analysis. Database bidirectional sorting is allowed, with up to nine keys, but there's no allowance for case sensitivity during sorts. Database queries are also limited, with no wildcard or update features, although you can use *InstaCalc* to query both its own spreadsheets and external *dBASE* files.

InstaCalc has no trouble creating and printing basic data-driven charts. It includes seven basic chart types (bar, stacked-bar, pie, area, line, x,y, and hi-lo) but doesn't have the advanced chart or spreadsheet publishing features found in the high-end spreadsheet programs.

The macro language, with learn mode and a macro editor, is a typical modern

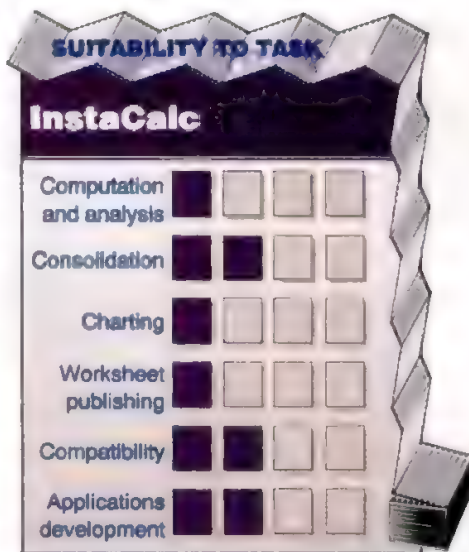
macro language with menu structures, dialog boxes, windows, conditional branching, and the ability to run other macros or external programs. Macro debugging tools include a single-step trace mode and the ability to insert breakpoints in macros that activate if certain conditions or errors occur.

A LOT LIKE LUCID

InstaCalc is most comparable to *DacEasy's Lucid 3-D*, Version 2.2. Both programs cost just under \$50, both can run in TSR mode, reserving little RAM when not loaded, and both can run .WKS and .WK1 spreadsheets. *Lucid* is faster at mathematical recalculations than *InstaCalc*, but it's faster than any package at that operation. *InstaCalc's* edge is that it can read 1-2-3 files without loading a translation program first (a necessity with *Lucid*), and *InstaCalc's* menu structure is similar to that used by 1-2-3, while *Lucid's* command hierarchy is very different and proprietary.

InstaCalc's performance test times range from average to slow, with its worst performance on recalculation times, the area in which *Lucid* excels. In the real world, however, if you need high-speed performance you'll probably buy a more-powerful product anyway; *InstaCalc's* users look for convenience, basic functionality, and ease of use.

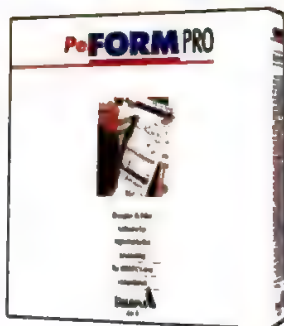
InstaCalc is recommended without hesitation as an easy-to-use spreadsheet for small files. Anyone who wants a spreadsheet that can run unobtrusively as a TSR, or those who just want a basic spreadsheet at a bargain price, should take a close look.



CONTINUES

★PerFORM PRO

(Delrina) Delrina puts the power and versatility of Windows 3.0 behind its newest selection of advanced design tools with PerFORM PRO. Meet your "high-end" form design and data management requirements with customized electronic business forms. Unique features include form folders, electronic signature security, If...Then statements and entry validation, in addition to enhanced graphics image importing and full color support. **BS2604 \$185.**



★QEMM 386 6.0

(Quarterdeck) New and enhanced! Gain up to 200K or more of previously unusable memory. New features include Stealth, which diverts system ROM into other areas, giving you much more memory. QEMM will also manage EMS, EEMS or extended memory, and includes automatic memory conversion, full compatibility with Windows and speed optimization of memory. Includes free Manifest, the award-winning diagnostic tool. **EX1103/5 \$61.**



★CorelDRAW! 2.0

(Corel Systems) CorelDRAW! is the award winning PC graphics software that gives you incredible type control and superb drawing power in a value-packed program. Now, CorelDRAW! 2.0 comes with more drawing power and over 150 fonts; over 3,500 clip art images and symbols; 31 import/export filters; an autotrace utility, a font conversion program and Mosaic, a visual file manager. **GR0543/5 \$369.**



★UltraScript PC Plus 3.0

★UltraScript PC 3.0

(PM Ware) Print PostScript text and graphics on DotMatrix, Inkjet, and Laser Printers. Scale and rotate fonts, import graphics and print from within your application program, even Windows 3.0. UltraScript PC has 25 fonts included. UltraScript PC Plus has 47 fonts. Version 3.0 is Adobe Type One Font Compatible. **UltraScript PC Plus 3.0 BS4174 \$249.** **UltraScript PC 3.0 BS4154 \$109.**



★WideAngle 2.0

(Attitask Software) Simplify DOS-to-Windows migration. Eliminate desktop clutter. WideAngle expands desktop to nine screen-sized workspaces...each only a click or hot key away. XRAY View "sees through" Windows clutter to find hidden apps/icons. Customize hotkeys, auto-launch groups, and workspaces. **UT1754 \$65.**



DesignCAD 3-D 3.1

(American Small Business Co.) DesignCAD 3-D will give your PC the power of a mainframe CAD system at a fraction of the price. Determine the volume, surface area, center of gravity and interference between objects. DesignCAD supports more than 400 peripheral devices and is compatible with an extensive array of graphics software and CAD systems, including AutoCAD. **CA0023/5 \$189.**

WordPerfect® 5.1

(WordPerfect Corporation) WordPerfect® 5.1 provides you with features such as pull-down menus, mouse support, tables, an equation editor, automatic formatting and pagination, an enriched mail merge function, and importing and sizing of graphics. Hyphenation is now dictionary-based and spreadsheets can be imported into WordPerfect 5.1 documents. **WP0363/5 \$249.**



**MicroWarehouse
YOUR
WINDOWS
SOURCE!**

Item numbers ending in 3 and 5 denote products available in 3 1/2" and 5 1/4" formats, respectively. Item numbers ending in 4 denote that both formats are included. Please refer to item numbers when ordering.

★ Windows-compatible products

COMPUTERS & MEMORY

Leading Edge	
CP0140	D3/SX 386-16 V6A 999.
CP0160	D/LT 386SX Plus Laptop 100MB 1695.
CP0150	N3/SX Notebook 40MB 1695.
Sharp	
CP0080	Wizard QZ 8200 399.
Memory	
MY0010	SIPPS, SIMMS, DRAMS Call.
MY0013	SIMM, 256K 100ns 21
MY0005	SIMM, 1MB 100ns 55
MY0005	SIMM, 1MB 70ns 63
MY0004	SIMM, 1MB 80ns 59.

EXPANSION & UPGRADES

ATI Technologies	
EX2020	ATI 8514 Ultra 565.
EX2010	VGA Stereo FX 325.
Aview	
EX1940	Desktop TV VG1 299.
Boca Research	
EX1840	BRAT90 with 0K 115
Brown - Wagh	
EX1510	MIDI Connector for SoundBlaster 59
EX1800	Sound Blaster Pro 195
Cardinal	
EX1560	VGA 732 169.
Digital Vision	
EX1195	ComputerEyes Prof. Series 359
EX1610	ComputerEyes Color/RT 499.
InfoChip Systems	
EX1640	Expanz Plus Expander Card 95
Intel	
EX1110	Co-Processor 80387/SX 125
EX0180	Co-Processor 80387-20 209
Media Vision	
EX1580	ProAudio Spectrum 259.
Persons Technologies	
EX2060	PC Speakers 179.
Stac Electronics	
EX1480	Stacker 99
EX1490	Stacker Co-Processor 149

MEDIA & ACCESSORIES

Curtis	AC2920	Command Center 85
--------	--------	-------------------------

AC0180	Computer Tool Kit	19.
Disks (boxes of 10)		
	BASF, Sony, Maxell	Call.
Interex		
AC3760	Multiport 2-Position ser Data Switch	18.
Kensington		
AC0140	Masterpiece Plus	95
LB Innovators		
	Var Colors Wrist Saver w/ MousePad	21.
	Various Colors Wrist Saver	13.
	Various Colors Wrist Saver MousePad13	13.

Targus		
AC2340	Premier Leather Case	169
AC3360	Lappac 5 Deluxe Case	48
AC0570/80	Leather Laptop Case	135
AC0670	Universal Notebook Case	66
Upsonic		
AC3800	PC Might 25	149
Wheeltech		
AC4010	FloppyMaster 150	59

DRIVES/CD ROM

HyperGlott	CD0210	Learn To Speak Spanish 65
Iomega	DR2060	Bernoulli 90MB Cartridge 145

**ORDER
24 HOURS
A DAY, 7 DAYS
A WEEK!**

DR0600	5.25" 44MB Storage Cartridge 83.
DR0560	Bernoulli Box II 44MB Int. 789
DR1970	Bernoulli 90MB Transportable 799.

MicroSolutions

DR2140	backpack 100Mb Call.
DR1260	backpack 1.2 199.
DR1240	backpack 1.4 199
DR1790	backpack 2 8Mb 229
DR2080	Qic 80 Tape Drive 449

Optical Access International

CD0180	CM 50 Portable CD-ROM 399
BN0040	CM 50 Port. CD-ROM/CorelDRAW 799.

Plus Development

DR1890	HardCard II XL 50 399.
DR1250	HardCard II XL 105 MB 469.

Teac

DR0910	Teac 3.5 1.44 FD 75.
--------	----------------------------

PRINTERS & CARTRIDGES

Adobe	
BN0080	Adobe PostScript Cartridge with Type Cartridge 1 299.
BN0070	Adobe PostScript Cartridge with Type Cartridge 2 299
	★ ATM Plus Pack 125.
PR1314	
AEG Olympia	
PR1750	NP80-24E Printer 279.
Canon	
PR1710	Auto Sheet Feeder for BJ-10e 72.
PR1500/10	Bubble Jet BJ-10ex 325
PR2240	Bubble Jet BJ - 300 459.
PR2230	Bubble Jet BJ - 330 599.
PR0460	LBP8 Plus Mark III 1499.
PR0640	LBP4 Plus Laser Printer 999.
Citizen	
PR2320	GSX-140 Plus Color Printer 329.
Epson America, Inc.	
PR2130	EPL - 7000 Laser Page Printer 879
IQ Engineering	
PR0610	Super Cartridge 2 299.
PR1950	Super Cartridge 3 Pro 299.
Metro Software	
PR1304	PC Accufax 69.
Pacific Data Products	
PR1120	25 Cartridges in One! 269
PR0910	Pacific 4 Memory w/ 2Mb 145.
PR0490	PacificPage w/1.2.4 Plus 2mb 375.
Panasonic	
PR2200	KX-P1124i Printer 299.
PR2190	KX-P2624 Silent 469.
Seiko Instruments	
PR2180	Smart Label Plus Printer 175.

CHECK OUT OUR PRICES!

OVERNIGHT DELIVERY

Only \$7.00

MODEMS & FAX BOARDS

Hayes		
FX0020	JT Fax 9600B Int.	379
MM0930	OPTIMA 96 Smartmodem	499
MM0250	Personal Modem 2400 Plus Ext.	149
MM0810	Pocket Edition 2400	125
MM0210	Ultra SmartModem 9600 V.32	689
MM0860	Ultra 144 V.32 BIS, Ext.	849
Intel		
FX1000	Satisfaction Classic PC/XT	389
PowerUser		
MM0630	Sendfax 24/48	68
MM0640	Sendfax 24/96	85
MM0680	Send/Receive fax 24/96	183
MM0650	2400 Mini Ext.	85
MM0670	2400 Plus Int. w/MNP 5	149
Practical Peripherals		
MM0390	9600SA Ext.	465
MM0160	PM2400SA Ext. w/ MNP 5	209
Prometheus		
MM0610	ProModem 24/96BSR	218
MM0700	ProModem 9600 Plus	599
MM0790	ProModem Ultima	750
MM0940	ProModem 2400 Plus	159
MM1020	ProModem Remote Plus	249
The Complete PC		
FX0060	The Complete Communicator	295
FX0040	The Complete Fax/9624	239
Zoom Telephonics		
MM0690	HC2400S w/9600 Sendfax Int.	95
MM0680	MX2400S w/9600 Sendfax Ext.	119
MM0600	Modem V 42bis 2400 Ext.	155
MM0820	V.32 Turbo	455

NETWORKING

3-Com		
NT0060	Ethernet II-Single User	199
Artisoft		
NT0110	Lantastic 2 MBPS Adapter Card	149
NT0145	Lantastic Ethernet Starter Kit	498
NT0150	Lantastic Ethernet Adapter Card	205
MainLan Inc.		
NT3324	MainLanEasy	149
Silka		
BS0535	Flashcard	149
BS1973/5	DOSTOPS Network Bundle	155
Xircom		
NT0040	Pocket LAN Adapter Ethernet BNC	395

INPUT DEVICES

Appoint		
IN2130	Mouse Pen Professional	65
IN2260	Thumbelina	89
Caere		
IN2314	★ The Typist Plus Graphics (AT)	389
IN0994R	★ The Typist (PS/2)	389
CH Products		
IN0910	FlightStick with Falcon 2.0	45
Kensington		
IN0850/50	Expert Mouse (bus/ser)	115/109
Logitech		
IN1070	Scanman 256	289
IN2250	Trackman Portable	99



PC Speakers

(**Persona Technologies**) PC Speakers provide high quality stereo sound from your PC. If you're working with MIDI synthesizers, CD-ROMs, interactive videodiscs, or voice synthesis, you'll appreciate these compact, full-range speakers. Frequency response is 75Hz to 18kHz, and they have internal amplifiers (10 watts/channel), plus volume and bass controls. Speakers mount easily to the sides of any monitor. **EX2060 \$179.**

Shipping - Your choice:
Fast, dependable, overnight service - \$7 up to 7 lbs. Orders for in-stock items placed by 7:00pm ship same day. Ground service available - \$3 (same day shipping).

Marstek

IN2310	★ Color Artist Hand Scanner for Windows 3.0	489
IN1040	M-800 Scanner w/OCR	205
IN2000	★ M-800W Scanner w/Image-In	199
IN2070	M-6000CG ColorArtist w/ OCR	499

Microsoft

IN2150	Ballpoint Mouse	119
IN0890/80	Mouse (bus/ser)	85
IN0275/84	★ Mouse w/Windows (bus/ser)	145

MicroTouch Systems

IN0810	The UnMouse	165
--------	-------------	-----

The Complete PC

IN2110	Complete Page Scanner w/ WordScan OCR Software	525
--------	--	-----

Z-NIX

IN1013/15	★ SuperMouse II (bus) w/Win 3.0	89
IN1003/5	★ SuperMouse II (ser) w/Win 3.0	89
IN1023/5	★ SuperMouse II (PS/2) w/Win 3.0	89

MONITORS

NEC

MT0360	MultiSync 15" 3FGx	669
MT0370	MultiSync 15" 4FG	799
MT0380	MultiSync 15" 5FG	1425

Various

MT0280	PanaSync C1381 14" VGA Color	369
MT0320	Samtron Super VGA Color	329
MT0240	Sony 14" Multiscan CPD-1304	675

ENTERTAINMENT & EDUCATION

Abracadabra

EN2694	Design Your Own Home (Architecture)	49
EN2684	Design Your Own Railroad	35

Artworx

EN2113/5	Bridge 6.0	27
----------	------------	----

Broderbund

ED0874	Carmen San Diego Deluxe	49
EN0734	Sim City	29
ED0184	Where in the USA is Carmen San Diego	29

Brown-Wagh

EN0910	Sound Blaster	115
--------	---------------	-----

Centron

EN1073/5	Casino Master	39
----------	---------------	----

Electronic Arts

EN2574	★ Chessmaster 3000 for Windows	45
--------	--------------------------------	----

Entertainment On Line

EN2014	Lottery Tracker & Wheeler 4.0	29
--------	-------------------------------	----

Masque Publishing

EN1384	Blackjack	39
--------	-----------	----

MECC

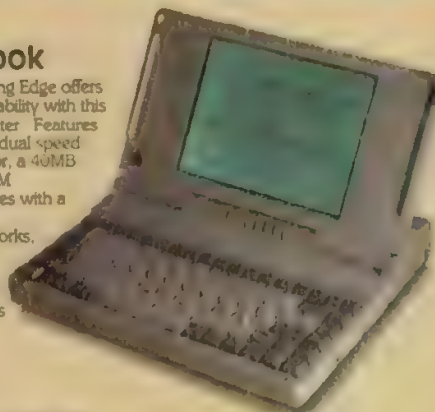
ED0514/04	Word/Number Munchers	ea.29
-----------	----------------------	-------

Microsoft

EN1473/5	★ Entertainment Pack	27
EN0043/5	★ Flight Simulator 4.0	38

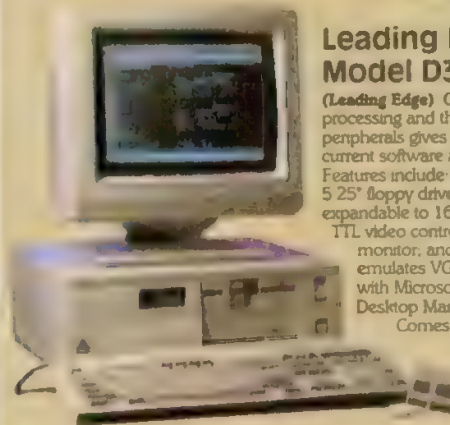
N3/SX Notebook

(**Leading Edge**) The Leading Edge offers you convenience and portability with this compact notebook computer. Features include a powerful 386SX dual-speed 16-20 MHz microprocessor, a 40MB hard drive and 2MB of RAM expandable to 5 MB. Comes with a mini trackball, Microsoft Windows 3.0, Microsoft Works, MS DOS, Basic and manufacturer's 1-year warranty. A rechargeable battery gives you 2.5 hours of computing time. **CP0150 \$1695.**



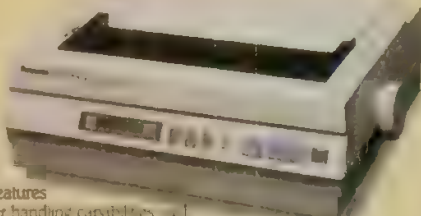
Leading Edge Model D3/SX

(**Leading Edge**) Combined power of 32-bit processing and the economy of 16-bit ISA peripherals gives you compatibility with all current software and future 32-bit software. Features include: 40MB hard drive; 3.5" and 5 25" floppy drives; 1MB of RAM expandable to 16MB; 101-key keyboard, TTL video controller and 14" color VGA monitor, and the controller card emulates VGA/EGA/VGA/MDA. Comes with Microsoft Works 3.0, GeoWorks Desktop Manager, MS DOS, and Basic. Comes with a 12-month on-site warranty. **CP0140 \$999.**



KX-P1124i

(**Panasonic**) Announcing the Panasonic KX-P1124i printer, a high speed 24-pin printer with the high end printer features you need. Control all of your printing features, save and recall them, for up to four different applications using the EZ Set operator panel. Other features include: a wide variety of paper handling capabilities, as rear, bottom, front and top paper feed paths and a push/pull tractor. Offers excellent print quality with 11 resident fonts in ten different sizes and 360 x 360 dpi resolution. Includes a two-year limited parts and labor warranty. **PR2200 \$299.**



FREE CATALOG!

We carry more than 1200 PC solutions including all the latest releases and updated versions. Just fill in the information requested below and we'll start your free, one-year subscription to the MicroWAREHOUSE catalog.



I'm Kerry, call me at:

MicroWAREHOUSE

1-800-367-7080

(1-800-DOS-7080)

Inquiries: 908-370-0518 Fax#: 908-905-5245
Order Toll-Free 24 Hours a Day, 7 Days a Week

Free Micro Warehouse Catalog Subscription

1880 Oak Street, P.O. Box 3014, Lakewood, N.J. 08701-3014

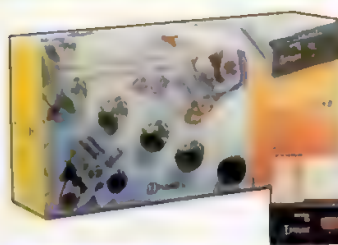
Fill out and mail this coupon to receive a free, one-year subscription to the MicroWarehouse catalog.

Name _____
Address _____ Apt. _____
City _____ State _____ Zip _____
(Expect to receive your next issue within 4-6 weeks)

CIRCLE 225 ON READER SERVICE CARD

1PM122

MICROWAREHOUSE CHECK OUT OUR PRICES!



OPTIMA 96 Smartmodem

(Hayes) Great Value! Optima 96 offers the best of both worlds - you don't have to choose between price and quality. OPTIMA 96 delivers the price you want and the quality features you need. And, it comes with free communications software and other special offers to give you a complete, value-packed communications solution.

MM0830 \$499.

Bernoulli 90MB Transportable

(Iomega) The new Bernoulli Transportable gives you the convenience of removable media plus lightweight, extremely rugged design. High capacity disks store up to 90 MB of data in a removable cartridge format, with 19 ms access time (13 ms effective access time with cache software). DR1970 \$799.



Timeslips III 4.0

(Timeslips Corp.) Professional firms can now simplify the tedious task of billing. A timer module operates in pop-up window, accessible within any application. Accommodates up to 3,400 clients, with as many as 250 professionals. Features time and expense tracking, a choice of customizable bill formats, customer management reports and complete account receivable tracking. BS0133/5 \$189.



Lotus Agenda 1.01

(Lotus) Lotus Agenda is your solution to managing people, projects and time. Agenda consolidates, organizes and prioritizes your information so you can view and understand it better. With Agenda you work, think, and solve problems better. And yes, even remember better. BS0344 \$49.



AutoMap

(AutoMap, Inc.) AutoMap helps you to find the best route for your trip-whether for business or pleasure. It finds the fastest, most scenic, or most convenient route, depending on your needs and prints a map and trip instructions for you. Features map displays, and even lists alternate routes. BS3224 \$59.

FloppyMaster 150

(Wheeltech) Free up valuable desk space with the FloppyMaster 150. This instant access disk carousel holds up to 150, 3.5" diskettes. Each section holds a maximum of six disks. Includes five colors of perforated labelling stock to help you identify files and/or software. Measures 16"x16"x4.25". AC4010 \$59.



UnMouse

(MicroTouch Systems, Inc.) Use the most intuitive pointing device ever designed—your own finger. Introducing the UnMouse by Micro Touch. It features a touch sensitive glass tablet with one million touch points that respond instantly for truly outstanding graphics capabilities. Unique templates allow you to execute function keys directly from the tablet. IN0810 \$165.

Optimum Resources Inc.

ED2164 StickyBear Reading Tutor 29.
ED2174 StickyBear Math Tutor 29.

PC Globe Inc.

BS1834 PC Globe 4.0 37.
BS1844 PC USA 2.0 35.

Personal Training for Windows

ED2343 ★ Excel Advanced Spreadsheets 59.
ED2323 ★ Excel Beginning Spreadsheets 49.
ED2363 ★ Excel Business Graphs 59.
ED2333 ★ Excel Intermediate Spreadsheets 59.
ED2373 ★ Excel Macros 59.
ED2353 ★ Excel Powerful Spreadsheets 59.
ED2423 ★ PageMaker Beginning 49.
ED2273 ★ PageMaker Intermediate 59.
ED2283 ★ PageMaker Tips and Techniques 49.
ED2243 ★ Windows 3.0 Getting Started 49.

Sir-Tech

EN2173 Bane of the Cosmic Forge 35.
EN2763/5 Crusaders of the Dark Savant 49.
EN2164 Freakin Funky Fuzzballs 19.

DESKTOP PUBLISHING & GRAPHICS

Adobe

PR1594 Adobe Fonts (various) Call.
GR2094 ★ Adobe Type Manager 59.
★ TypeAlign 65.

Aldus

GR2053/5 ★ PageMaker 4.0 489.
GR2174 ★ Persuasion 2.0 335.

Application Techniques, Inc.

GR2134 ★ PictureEze 1.0 95.
BS0204 Pizzazz Plus 2.0 65.

Atech

GR2763/5 ★ Pub. Powerpak for Windows 55.
GR2773/5 Pub. Powerpak for WordPerfect 55.

Autodesk

GR0904 Autodesk Animator 263.

Berkeley Systems

GR1994 ★ After Dark for Windows 29.

Bitstream

GR1844 ★ Facelift for Windows 58.

Broderbund

GR1564 New Printshop 35.
GR0064 New Printshop Companion 29.

Caere Corporation

GR2074 Omnipage Professional 649.

Calera

GR2064 ★ WordScan 239.
GR2114 ★ WordScan+ 669.

Computer Associates Int'l

GR1823 ★ CA Cricket Graph 1.3 85.

Corel Systems

GR0543/5 ★ CorelDRAW! 2.0 369.

Gold Disk Inc.

GR3124 ★ ScreenCraze for Windows 29.

Icom Simulations

GR1854 ★ Intermission 2.0 32.

Micrografix

GR2783/5 ★ Designer 3.1 485.
GR2833/5 ★ Windows Draw! Call.

Micrologic

GR1444 MoreFonts 2.0 79.

Microsoft

BS2304 ★ Powerpoint for Windows 315.
GR2830 ★ Microsoft Publisher for Windows 129.

New Visions Technology

GR0823/5 ★ Presentation Task Force 3.0 134

Power Up Software

GR0884 Express Publisher 2.0 99.

Software Publishing

GR2303/5 Harvard Graphics 3.0 415.

Timeworks

GR2334 Publish-It! 2.0 135.

Ventura Software Inc.

GR1574 ★ Ventura Pub. Gold 3.0 (Win.) 559.

WordPerfect

GR1194 DrawPerfect 1.1 269.

ZSoft

GR0634 PC Paintbrush IV Plus 119.
GR2024 ★ Publisher's Paintbrush 2.0 299.

CAD PRODUCTS

American Small Business Co.

CA0023/5 Design CAD 3D 3.1 198.

CA0203 Design CAD 2D 5.0 175.

AutoDesk

CA0173/5 Autosketch 3.0 146.

Computer Easy

CA0153/5 Dream House Professional 47.

ForeSight Resources

CA0124 ★ Draftx CAD for Windows 3.0 435.

Generic Software

CA0074 Generic CADD 5.0 285.

IMSI, Inc.

GR2384 TurboCAD Release 2 89.

MathSoft

CA0193/5 MathCAD 3.0 315.

BUSINESS

Abacus

UT1684 ★ Becker Tools 2.0 75.

Absolute Solutions

FN0553/5 ★ Evolve 129.

AddStor

UT2194 SuperStor 85.

Artworx

BS4094 Graftek 85.

Ashton Tate

BS0773/5 dBASE IV 1.1 485.

Atitash Software

UT1754 ★ WideAngle 65.

AutoMap, Inc.

BS5224 AutoMap 59.

Avery

GR0804 Label Pro Laser 45.

Borland International

BS0214 Paradox 3.5 519.

BS3044

Quattro Pro 3.0 319.

Buttware

BS5134 PC-File 6.0 85.

Campbell Services, Inc.

BS3584 ★ OnTime for Windows 75.

Central Point Software

UT2064 Central Point Anti-Virus 79.

UT2133

PC Tools 7.1 109.

Chipeoft

Turbo Tax for DOS Personal/1040 .. Call.

Chronologic Corp.

UT0584 Instant Recall 62.

Clarian Software

LN1484 Personal Development System 2.0 47.

Contact Software Int'l

BS1064 ACT! 2.01 225.

DacEasy Inc.

FN0014 Dac Easy Accounting 4.2 95.

FN0024

Dac Easy Bonus Pak 4.2 129.

BS3484

Rolodex Live 29.

Darians Technology

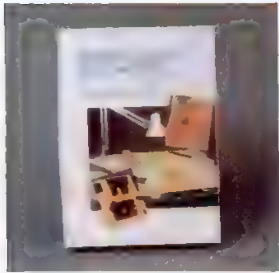
UT1904 System Sleuth Pro 3.0 85.

MICRO WAREHOUSE

1690 Oak Street, P.O. Box 3014, Lakewood, NJ 08701
©1991 Micro Warehouse Inc.

- Visa and Mastercard accepted.
- Your credit card will not be charged until your order is shipped.
- Purchase orders subject to credit approval
- All products covered by 120 day full warranty *
- * Defective software replaced immediately
- Hardware replaced or repaired at our discretion.
- Connecticut, New Jersey and Ohio residents add appropriate sales tax
- Orders for in-stock items placed by 7:00 p.m.(E) weekdays (barring system failure, etc.) ship overnight by Airborne Express. (Some areas require an extra day)
- Shipping charge \$7 per order up to 7 lbs. \$1 per lb. above 7 lbs.
- UPS ground service also available upon request - \$3 per order
- UPS orders placed by 3:00p.m. (E) weekdays, ship same day
- Actual freight charges apply for computers, hard disks, Bernoulli's, tape back ups, monitors and UPS printers
- Alaska, Hawaii outside continental U.S.
- APQ/FPO call for information
- Item availability and price subject to change without notice.
- Software is not copy protected, except where marked by asterisk
- We reserve the right to limit quantities.
- Please indicate trade date

NEW!



Design Your Own Home, Architecture (Abracadata) Everything you need to create professional drawings. Print floor plans to scale, plan overlays, draw side-view building plans and structural details with ease. Includes dozens of sample plans. **EN2694 \$49.**



Design Your Own Railroad (Abracadata) Design precision, to scale, (H.O., N, Z, O, S, G). Layouts and run realistic railroad simulations. It's desktop railroading... better than a model railroad in your basement! **EN2684 \$35.**



Intermission 2.0 (Icom Simulations) Intermission 2.0, the essential, entertaining screen saver protects your monitor from burn-in with 55 amazing animated displays. Provides password protection and is Novell Network compatible. **GR1854 \$32.**

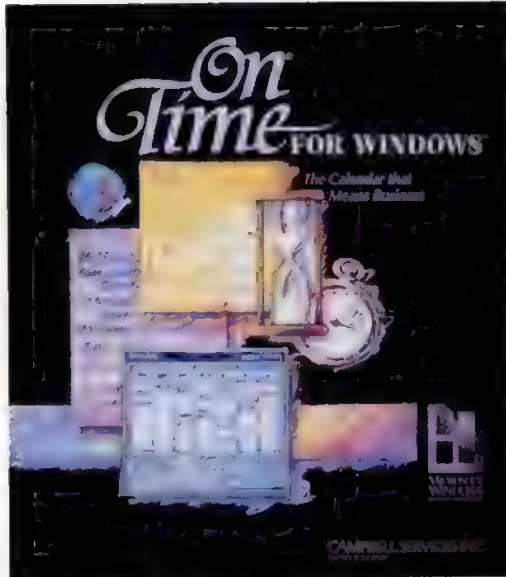


ProModem Remote Plus (Prometheus) Battery-operated, 2400 bps data/9600 bps send/receive fax modem that eliminates the need for a power supply. Supports V.42 error correction/ MNP-5 data compression; includes all software. **MM1020 \$249.**

★ OnTime for Windows

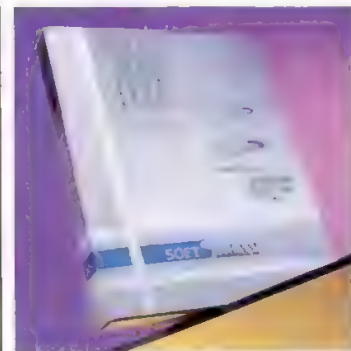
(Campbell Services)

OnTime for Windows gives you an indispensable combination of productivity tools - a calendar, an appointment book, a to-do list, pocket secretary, desktop planner, tickler file, and even an alarm clock. It displays your daily schedule on screen, with a choice of hourly, 30, or 15 minute increments. Or, you can view your entire schedule at a glance, by week, month, or year. OnTime's tri-fold printout, which shows up to 7 weeks at a glance, is the talk of the industry. Find information quickly with keyword search. An alarm sounds to remind you of important events. Requires Windows 3.0. **BS3584 \$75**



UT1704	★ Win Sleuth 1.0	85
Datastorm Tech.		
CM0424	PROCOMM PLUS 2.01	65
DCA/Crosstalk Communications		
CM0194	★ Crosstalk for Windows 1.2	129
Delrina Technology		
BS0853/5	PerFORM Designer & Filler 2.1	90
BS2604	★ PerFORM PRO 3.0	185
FX0154	★ WinFax Pro 2.0	75
Fisher Idea Systems		
BS3543/5	IdeaFisher 3.1	399
Fifth Generation		
UT0724	Direct Access 5.1	62
UT2184	Fastback Plus 3.0	125
Fox Software		
BS0705	Foxbase + Dev. System 2.10	189
BS4065	FoxPro 2.0	485
Funk Software		
BS0624	Sideways 3.3	59
GeoWorks		
OP0064	GeoWorks Ensemble	125
Gibson Research		
UT0874	Spirinite II 2.0	65
hDC Computer Corp.		
UT1944	★ FileApps	75
UT1634	★ FirstApps	55
UT0644	★ Windows Express 3.0	55
Helix		
BS3154	★ NetRoom Single User 2.0	49
Hewlett-Packard		
BS2783/5	★ New Wave 3.0 for Windows	109
Infinity Software		
BS5364	★ Winvoice	165
Inset Systems		
UT1614	HiJaak 2.1	99
Intuit		
FN0164	Quicken 5.0	43
FN0564	★ Quicken for Windows	45
FN0434	QuickPay	30
Jian Tools		
BS1614	BizPlan Builder 4.0	89
Lotus		
BS0344	Agenda 1.01	49
BS3174	Agenda 2.0	288
BS4204	Ami Pro 2.0	299
BS5203/5	Lotus 1-2-3 3.1 Plus	419
BS4073/5	Lotus 1-2-3 Rel. 2.3	339
BS2433/5	Lotus 1-2-3 Rel. 3.1	405
BS5253/5	★ Lotus 1-2-3 for Windows	399
BS3973	Lotus Graph Writer II	335
Magee		
UT0844	AutoMenu 4.7	38
Metro Software		
UT0563/5	LaserTwin All-in-One	115

Microcom		
CM0084	Carbon Copy Plus 6.0	115
CM0564	★ MicroCourier	65
CM0124	★ Relay Gold 5.0 for Windows	189
UT0894	Virex PC	78
Micro Logic		
BS5124	InfoSelect 2.0	89
Microsoft		
OP0113/5	DOS 5.0 Upgrade	59
BS3254	★ Excel for Windows 3.0	309
FN0464	★ Microsoft Money for Windows	45
BS4103/5	★ Office for Windows	485
BS2733/5	★ Productivity Pack	39
BS2704	★ Project for Windows 1.0	445
BS2253/5	★ Windows 3.0	99
BS1954	★ Windows Developer's Tool Kit	315
WP0043/5	Word 5.5	209
WP0374	★ Word for Windows 1.1	309
BS5324	★ Microsoft Works for Windows	129
BS0173/5	Works 2.0	95
Microsoft/Helix		
BN0043/5	DOS 5.0/Netroom Bundle	99
Multisoft Corporation		
UT0554	PC-Kwik Power Pak 2.1	70
UT0543/5	Super PC - Kwik 4.1	45
Musa		
FN0344	Paccioli 2000	28
Niles & Associates		
BS3444	EndNote	95
Nolo Press		
BS0124	Willmaker 4.0	35
Norton-Lambert		
CM0503/5	★ Close-Up 4.0 (Windows & DOS)	119
Okna Corporation		
BS3124	★ Desk Top Set	79



Peachtree Software		
FN233/5	Peachtree Complete II 5.0	145
FN0254/5	Peachtree Comp. III Bonus Bde	215
PM Ware		
BS4174	UltraScript PC Plus 3.0	249
BS4154	UltraScript PC 3.0	109
Polaris		
BS2894	★ ParkRat 4.0	259
BS2934	★ ParkRat 4.0 for Networks	429
Power Up Software		
BS1654	Calendar Creator Plus 4.0	45
Precision Software		
BS1874	★ Superbase 4 Windows	410
Qualitas		
UT0683/5	386Max 6.0	67
UT1673	BlueMax 6.0	79
Quarterdeck Office System		
BS0163/5	DESQview 2.4	79
BS1043/5	DESQview 386 2.4	129
EX1103/5	★ QEMM 386 6.0	61
Que Software		
WP0544	RightWriter 4.0	52
Reality Technologies		
FN0124	Wealthbuilder 1.1	95
BS0334	WealthStarter 2.0	35
Reference Software		
WP0334	Grammatik IV 2.0	55
WP0514	★ Grammatik Windows	55
Softstream		
TX0224	TaxTutor Plus	62
Software Directions		
UT1914	PrintQ 5.0	85
Software Publishing		
WP1523/5	★ Professional Write Plus	165
Spinnaker Software		
BS1923/5	BetterWorking Eight-In-One	32
BS3604	★ PFS:Window Works	125
BS1134	The Resume Kit	29
Symantec		
UT2154	Norton AntiVirus 1.5	85
UT2183/5	★ Norton Desktop for Windows	99
UT0054	Norton Util. Advanced 6.0	115
UT2153	★ Norton Backup Windows/DOS	85
CM0173/5	PC Anywhere 4.0	99
BS4013/5	Q&A 4.0	255
BS3723/5	★ On Target 1.0	255
Teleware		
FN0414	★ M.Y.O.B.	139
Timeslips Corp.		
BS0133/5	Timeslips III 4.0	189
Touchstone		
UT0734	Check It! 3.0	85
Traveling Software		
UT2074	Laplink Pro	89
UT2014	★ WinConnect 1.0	65
Vertisoft		
UT0904	Double Disk	62
WordPerfect Corp.		
WP0363/5	WordPerfect 5.1	249
WP1653/5	WordPerfect for Windows	295
WP0504	LetterPerfect 1.0	129
WordStar U.S.A.		
WP1604	★ Correct Grammar for Windows	59
WP1614	★ WordStar for Windows	279
XTree Company		
BS3243/5	VirusSale 4.5	49
UT1874	XTree Gold 2.0	92

LANGUAGES

Asymetrix		
LN1454	★ Toolbook	289
Borland International		
LN1654	Borland C++ 2.0 Prof	329
LN1664	★ Object Vision for Windows	95
LN1673	Turbo C++ 2nd Edition 1.0	69
LN0463/5	Turbo C++ for Windows	Call.
Microsoft		
LN0074	C Compiler 6.0	315
LN0085	QuickBasic 4.5	65
LN0043/5	QuickC 2.5	65
LN1674	Visual Basic	129
Nantucket		
LN1444	Clipper 5.01	510
Solution Systems		
LN0433/5	Brief 3.1 for DOS	179

TaxTutor Plus

(Softstream) TaxTutor Plus is a tax guide for maximum tax savings and a support tool for people working with any tax forms package. It provides clear line by line explanations and over a hundred tax savings examples. Learn how to make the tax laws work to your advantage. **TX0224 \$62.**

NEW!

SOFTWARE SPREADSHEETS

SPREADSHEETS: SUMMARY OF FEATURES

Products listed in alphabetical order

	CA-SuperCalc	InstaCalc	Lotus 1-2-3 for DOS, Release 2.3	Lotus 1-2-3 for DOS, Release 3.1 Plus	Lotus 1-2-3 for Windows	Lucid 3-D	Microsoft Excel
FUNCTIONS AND OPERATIONS							
Recalculation:							
By row	■	□	■	■	■	□	■
By column	■	□	■	■	■	□	■
Natural	■	■	■	■	■	■	■
Manual	■	■	■	■	■	■	■
Automatic	■	■	■	■	■	■	■
Intelligent	■	■	■	■	■	■	■
Background	□	□	□	■	■	□	■
Iterative	■	□	■	■	■	□	■
Total number of functions:							
Database	7	12	7	11	11	4	12
Date and time	16	13	11	13	14	9	14
Financial	18	12	11	12	12	11	14
Logical	18	9	9	6	10	4	15
Mathematical	18	26	17	17	17	17	29
String	16	17	19	18	18	6	21
Statistical	8	9	7	10	10	7	14
Total number of logical and arithmetic operators	17	15	17	17	17	14	17
User-definable	□	□	□	□	□	■	■
Matrix manipulation	■	■	■	■	■	□	■
Regression analysis	■	■	■	■	■	□	■
What-if tables	■	□	■	■	■	□	■
Linear and nonlinear optimization	■/■	■/■	□/□	■/■	■/■	□/□	■/□
FILE-LINKING FEATURES							
Formula in one file can contain reference to data in another file	■	■	■	■	■	■	■
Formula in one file can use a cell or range in another file as a function argument	■	□	□	■	■	□	■
Link returns a constant/formula	■/□	■/□	■/□	■/■	□/■	■/□	□/■
External reference formula can use wildcards to specify external filenames	□	□	□	■	□	□	■
External reference formula can reference data that does not exist yet	■	■	■	■	■	■	■
Updates links on demand/automatically	■/□	■/□	■/■	■/□	■/□	■/□	■/■
Saves groups of worksheets in workspace	□	□	□	□	□	□	■
3-D FEATURES							
Can have multiple 2-D sheets in a single file	■	□	□	■	■	□	□
Defines ranges across pages	■	■	□	■	■	□	□
Groups sheets for common cursor movement	■	□	□	■	■	□	■
Formats sheets together	■	□	□	■	■	□	■
DATABASE FEATURES							
Search-and-replace	■	■	■	■	■	■	■
Sorts by row/column	■/■	■/■	■/□	■/□	■/□	■/■	■/■
Maximum number of simultaneous sort keys	3	9	2	255	256	2	3
Searches by arithmetic/logical criteria	□/■	■/■	■/■	■/■	■/■	□/□	■
Joins two database tables	□	□	□	■	■	□	■
Queries external databases	□	■	□	■	■	□	■
Provides database entry screen	■	■	□	□	□	□	■
Supports multidimensional databases	□	□	□	□	□	□	□

■—Editors' Choice

■—Yes

□—No

Lotus 1-2-3 for DOS, Release 2.3

by Craig Stinson

Although other products have surpassed it both in quickness and richness of features, *Lotus 1-2-3*, Release 2.x, remains the ideal spreadsheet for many users. It runs millions of lines of existing macro code without modification, it's supported by a huge assortment of add-in products, and it's 100-percent compatible with—well, with *1-2-3*, Release 2.x.

Shipped last spring, Lotus Development Corp.'s \$495 *Lotus 1-2-3 for DOS*, Release 2.3, comes with three valuable add-ins: WYSIWYG (the Lotus-adapted version of PC Publishing's *Impress*), a file viewer, and an auditor. The Macro Manager add-in, included with Release 2.2, is still part of the package.

WYSIWYG is a particularly welcome enhancement to the Release 2.x line. Among other things, it allows you to embed and annotate live graphs on worksheets, use up to eight fonts at a time from a supply of Bitstream Swiss, Dutch, and Symbol fonts (you can add your own Bitstream fonts as well), center headings over columns, add word-wrapped text annotations, and dress up presentations with clip art (in .CGM or .PIC format).

WYSIWYG also allows you to work with your data and to apply formatting to it from the same graphics-mode screen. WYSIWYG has two serious shortcomings when compared with the *Allways* add-in bundled with Release 2.2. It's slower at printing, and it doesn't support landscape mode on dot-matrix printers. If you can live with these limitations, you'll find it a much more satisfactory publishing solution than *Allways*, especially since you can edit your spreadsheets from within the utility, something you can't do in *Allways*. Since WYSIWYG supports *Allways*-formatted files, you don't have to leave your earlier work behind.

SUITABILITY TO TASK

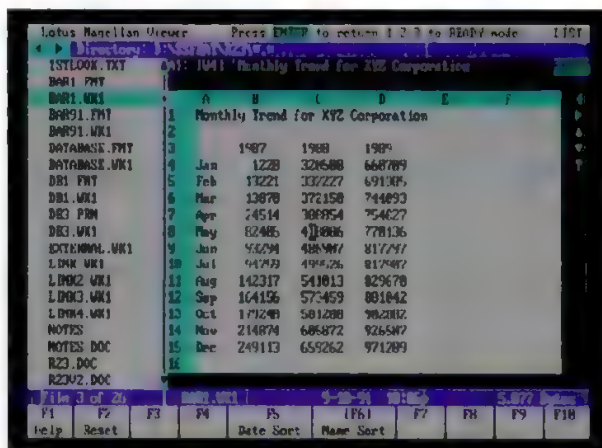
Lotus 1-2-3 for DOS, Release 2.3

Computation and analysis	☒	☒	☒	☒
Consolidation	☒	☒	☒	☒
Charting	☒	☒	☒	☒
Worksheet publishing	☒	☒	☒	☒
Compatibility	☒	☒	☒	☒
Applications development	☒	☒	☒	☒

NEW FILE VIEWER

The new file viewer add-in takes some of the sting out of one of Release 2.x's significant weaknesses—its inability to operate on more than one file at a time. The viewer lets you display portions of a second file in a smaller window and create external-reference formulas by pointing. Unfortunately, you can't use linked cells as operands or function arguments. The formulas that establish links are limited to referencing external values as constants. As a result, Release 2.3 remains a blunt tool for consolidation, compared with the likes of *Lotus 1-2-3 3.1 Plus*, *Microsoft Excel*, and *Quattro Pro*.

Meanwhile, the auditing add-in lets you highlight all of a formula's dependent or supporting cells. It can also help you trace through a circular-reference chain.



Lotus 1-2-3 for DOS, Release 2.3's new Viewer add-in uses *Magellan* technology to assist with file retrieval and linking. Otherwise, this release does not enhance the program's weak linking capability.

CONTINUES

SOFTWARE SPREADSHEETS

SPREADSHEETS: SUMMARY OF FEATURES

Products listed in alphabetical order

	CA-SuperCalc	InstaCalc	Lotus 1-2-3 for DOS, Release 2.3	Lotus 1-2-3 for DOS, Release 3.1 Plus	Lotus 1-2-3 for Windows	Lucid 3-D	Microsoft Excel
MACROS							
Auto-load macros	■	■	■	■	■	■	■
Auto-close macros	■	□	■	□	□	□	■
Event-driven macros	■	□	■	□	■	□	■
Learn mode for macros	■	■	■	■	■	■	■
Provides macro libraries	□	□	■	□	□	□	■
Macros can execute DOS commands	□	■	■	■	■	■	■
Macros can create custom menus	■	■	■	■	■	■	■
Unconditional branching	■	■	■	■	■	■	■
Conditional branching	■	■	■	■	■	■	■
Subroutines	■	■	■	■	■	■	■
Looping	■	■	■	■	■	■	■
File commands	■	□	■	■	■	■	■
Imports working Lotus macros	■	□	■	■	■	□	□
Single-step trace mode	■	■	■	■	■	■	■
Debugger	■	■	■	□	■	□	■
AUDITING FEATURES							
Allows notes on formulas	□	□	□	■	■	■	■
Contains map mode	■	■	□	■	□	■	■
Shows formula dependencies	■	■	■	■	□	■	■
Shows circular references	■	■	■	■	■	□	■
GRAPHING FEATURES							
Graph types available:							
Bar	■	■	■	■	■	■	■
Stacked bar	■	■	■	■	■	■	■
3-D bar	□	□	□	□	■	■	■
Pie	■	■	■	■	■	■	■
Hi-lo	■	■	■	■	■	■	■
x, y	■	■	■	■	■	□	■
Line	■	■	■	■	■	■	■
Area	■	■	□	□	■	□	■
Scatter	□	□	□	□	□	□	■
Screen/printer control of:							
Color	■/■	■/□	■/■	■/■	■/■	□/□	■/■
Font size	■/■	□/□	■/■	■/■	■/■	■/■	■/■
Font style	■/■	□/□	■/■	■/■	■/■	□/□	■/■
User can annotate graphs with floating text	□	□	■	■	■	□	■
User can customize graphs with freehand drawing	□	□	■	■	■	□	■
User can view graphs with worksheets	□	□	■	■	■	□	■
User can import clip art	□	□	■	■	■	□	■
Formats imported	N/A	N/A	CGM	CGM	All Windows formats	N/A	All Windows formats
PRINT FEATURES							
WYSIWYG preview	□	□	■	■	■	□	■
Prints text and graphics together	□	□	■	■	■	□	■
Landscape printing	■	□	■	■	■	■	■
Boxes and shading	■	□	■	■	■	□	■
Maximum number of fonts per worksheet	8	1	8	8	8	4	255
Supports PostScript text/graphics/combinations	■/■/■	□/□/□	■/■/■	■/■/■	■/■/■	□/□/□	■/■/■
Maximum length of setup string (characters)	240	80	40	40	39	254	255
Maximum number of printers supported	200	2	198	33	200	175	200
User can customize print drivers	□	□	□	□	■	□	■
Supports multiline headers and footers	■	□	□	□	□	□	□
Supports plotter	■	□	■	■	■	□	■
Background printing	□	□	■	■	■	□	■
Color printing	■	□	■	■	■	■	■

■—Editors' Choice

■—Yes

□—No

N/A—Not applicable: The product does not have this feature.

SOFTWARE SPREADSHEETS



Lotus 1-2-3 for DOS, Release 2.3
 Lotus Development Corp., 55 Cambridge Pkwy., Cambridge, MA 02142; 617-577-8500.
List Price: \$495.
Requires: 512K RAM, DOS 2.1 or later.
In Short: No longer the fastest spreadsheet in town, the *Lotus 1-2-3 for DOS*, Version 2.x, standard retains its lean, no-nonsense approach to number crunching. Major improvements in Release 2.3 include the WYSIWYG publishing add-in, a *Magellan*-style file viewer, an auditing add-in, new chart types, a mouse interface, and more-efficient use of expanded memory.

CIRCLE 401 ON READER SERVICE CARD

Upgrading Release 2.2 with a new stock of add-ins is consistent with Lotus's highly successful Release 2.x strategy: Keep the core product lean for those with mainstream spreadsheeting applications, and let users snap enhancements in and out as needed. The company has also addressed a few deficiencies under the hood.

Of major interest to power users, *1-2-3* now offers an enhanced EMS mode, in which pointers as well as data can be stored in LIM 4.0 expanded memory. This repairs an irritating shortcoming of previous versions, where users sometimes ran out of conventional memory long before the supply of EMS was exhausted. Because the enhanced mode imposes a small performance penalty, Lotus has implemented it as an option on the /Worksheet Global Default menu.

The graphing section of *1-2-3* has also been modestly improved. Release 2.3 offers high-low-close-open and combination line-bar charts, as well as bar charts in 3-D perspective. Unfortunately, the continued absence of area charts and true three-dimensionality (with two or more data series plotted in separate planes along a third axis) makes Release 2.3 look pale next to character-mode competitors *Quattro Pro* and *SuperCalc*.

INTERFACE CHANGES

To help users find their way through the classic Lotus menu tree, Release 2.3 now makes extensive use of interactive dialog boxes. These are also optional; you can banish them if you find them distracting.

One item that isn't optional is a new black-on-white color scheme for displaying spreadsheets—the reverse of the one that *1-2-3* has used for nearly a decade. The menu tree remains in white on black, and you can customize the WYSIWYG display colors, but when you run in text mode, you'll need to make a visual adjustment.

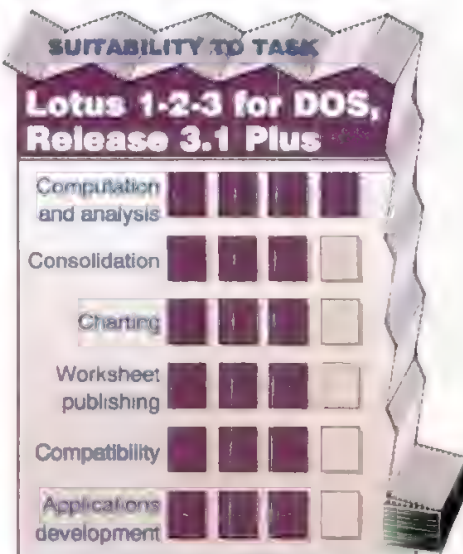
Release 2.3 was a respectable finisher on most of our performance tests (particularly those involving financial calculations), but performance is not the compelling draw for Release 2.x that it once was. Of course, that draw is hardly necessary. Release 2.x is a proven item; it works better than ever, and you don't have to retrain to use it. Lotus compatibility is the best reason to choose *Lotus 1-2-3 for DOS*, Release 2.3.

Lotus 1-2-3 for DOS, Release 3.1 Plus



by Craig Stinson

With the add-in-rich *Lotus 1-2-3 for DOS*, Release 2.3, at the low end of the feature spectrum and the suave (if blemished) *Lotus 1-2-3 for Windows* at the high end, the \$595 *1-2-3 for DOS*, Release 3.1 Plus, is starting to look like the odd man out in the Lotus lineup. It offers significant



CONTINUES

SPREADSHEETS: SUMMARY OF FEATURES

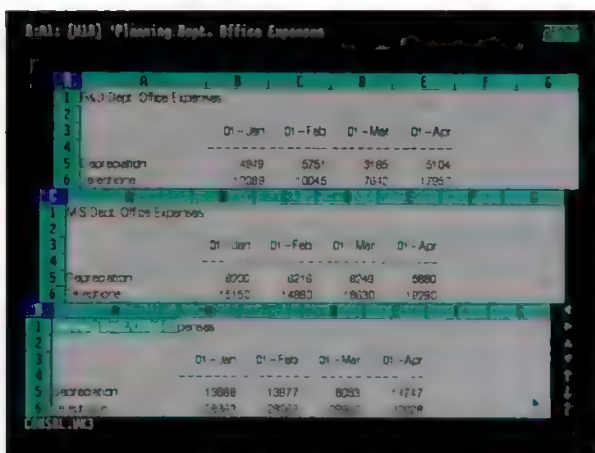
Products listed in alphabetical order

	CA-SuperCalc	InstaCalc	Lotus 1-2-3 for DOS, Release 2.3	Lotus 1-2-3 for DOS, Release 3.1 Plus	Lotus 1-2-3 for Windows	Lucid 3-D	Microsoft Excel
IMPORT/EXPORT							
.DBF	■ ■	■ ■	■ ■	■ ■	■ ■	■ / ■	■ ■
.DIF	■ ■	■ ■	■ ■	■ ■	■ ■	■ / ■	■ ■
.PIC	■ ■	■ / ■	■ ■	■ ■	■ ■	■ / ■	■ ■
.SLK	■ ■	■ / ■	■ ■	■ ■	■ ■	■ / ■	■ / ■
Symphony	■ ■	■ ■	■ ■	■ / ■	■ ■	■ ■	■ / ■
Text files	■ ■	■ ■	■ ■	■ / ■	■ ■	■ ■	■ ■
.WK1	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■
WKS	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■
LOTUS 1-2-3 COMPATIBILITY							
Loads and saves .WK1 files directly	■	■	■	■	■	■	■
Fully compatible with Lotus 1-2-3 macros	□	□	■	■	■	□	■
Can create macros that run in Lotus 1-2-3	□	□	■	■	■	□	■
Lotus 1-2-3-compatible menu tree	■	□	■	■	■	□	■
HELP							
Context-sensitive on-line help	■	■	■	■	■	■	■
Quick-start booklet	■	□	■	■	■	□	■
Tutorial program	■	□	■	□	■	□	■
Toll-free telephone technical support	■	□	■	■	■	□	■

■—Editors' Choice

■—Yes

□—No



The perspective view in Lotus 1-2-3 for DOS, Release 3.1 Plus, lets you see three pages of a 3-D worksheet at once. You can use this arrangement for easy consolidations or for putting all of your macros into a separate worksheet.

advantages over Release 2.3 for particular kinds of users, but those advantages are also available in *1-2-3 for Windows*. And the *Microsoft Windows* product, while off to a rocky start, should eventually bring a myriad of benefits not available in Release 3.1 Plus.

Compared with Release 2.3, the principal attractions in Release 3.1 Plus are three-dimensionality, the ability to keep multiple worksheets in memory, access to external database tables, disk-based virtual memory, a goalseeking command, a

nonlinear optimizer, slightly superior charting, the ability to handle 512-character formulas (with text annotations), and slightly more sophisticated range-naming features. The new *Windows* version of *1-2-3* includes all of these, plus significantly superior charting, dynamic data exchange (DDE), and in the next release, object linking and embedding (OLE).

On the other hand, *Windows* is not for everybody. If DOS is your preferred environment and you need any of the aforementioned capabilities, Release 3.1

Plus could be just the ticket.

THREE USEFUL ADD-INS

The latest upgrade to the Release 3.x line, Release 3.1 Plus, incorporates three valuable add-ins—the Viewer, the Auditor, and the Solver—plus a new *DataLens* driver for *Paradox*. The first two add-ins, also included in Release 2.3, help you browse worksheets on-disk and ferret out faulty worksheet logic. The Solver is the add-in equivalent of the nonlinear optimizer that Lotus previously incorporated

into *Lotus 1-2-3/G* for OS/2.

Of all its advanced capabilities, the one that's likely to matter most—and the one that's least likely ever to find its way into Release 2.x—is three-dimensionality. Release 3.1 Plus lets you create spread-



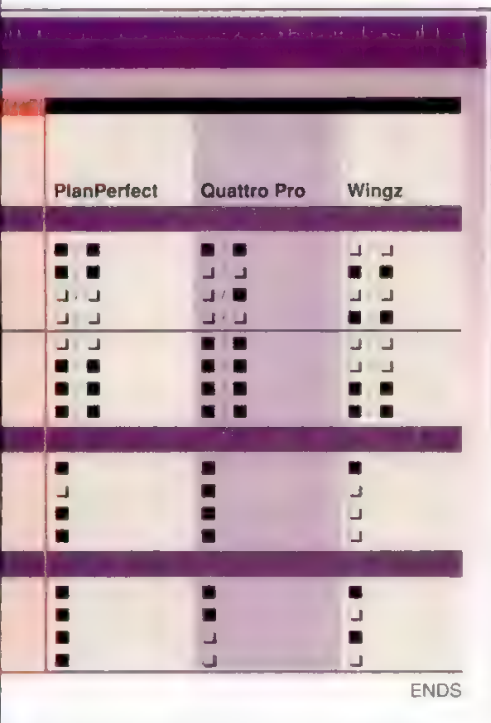
Lotus 1-2-3 for DOS, Release 3.1 Plus
Lotus Development Corp., 55 Cambridge Pkwy., Cambridge, MA 02142; 617-577-8500.
List Price: \$595.

Requires: 1MB RAM (3MB for Solver), DOS 3.0 or later.

In Short: In addition to the Release 2.3 feature set, *Lotus 1-2-3 for DOS, Release 3.1 Plus*, offers three-dimensionality, virtual memory, access to external data tables, and a nonlinear optimizer. Because *Lotus 1-2-3 for Windows* offers this and more, however, Release 3.1 seems destined to be a power tool for those who don't move to *Microsoft Windows*.

CIRCLE 402 ON READER SERVICE CARD

SOFTWARE SPREADSHEETS



sheet files consisting of up to 256 worksheet pages. Each page gets its own letter designation, and each cell's address has three coordinates—a page, a row, and a column. A group mode command makes it easy to set up identical structures and formats on parallel pages, and a *perspective view* option lets you see portions of three pages at once.

The importance of three-dimensionality is not that it lets cells on one grid reference cells on another (you can do that with almost every spreadsheet sold today) but that it lets you define and name ranges that span worksheet pages. This makes performing certain kinds of cross-sectional analysis easier in Release 3.1 Plus than in products such as *Quattro Pro* and *Microsoft Excel*, which allow multiple worksheets but are not three-dimensional. Unfortunately, unlike *ProCalc 3-D*, Release 3.1 Plus stops short of letting you rotate the page stack. If you want to see a cross-section of your numbers (not just a graphical plot), you have to resort to clumsy transposition commands.

For working with external database tables, Release 3.1 offers a *Data External* menu node. This invokes the *DataLens* driver of your choice—Lotus supplies drivers for *dBASE*, *Paradox*, and *SQL Server*—and allows you to treat the external table as though it were a standard

1-2-3 table. Unlike most other spreadsheet programs, this one also has the ability to perform joins on multiple internal tables.

Release 3.1 Plus's graph component puts out essentially the same set of charts as Release 2.3, but in keeping with its position as an advanced spreadsheet, Release 3.1 Plus lets you clarify complex graphs with a second y axis. And unlike Release 2.3, it lets you apply logarithmic as well as linear scaling.

Now that Lotus has replaced *Always* with WYSIWYG in the 2.x line, all of its PC spreadsheets finally offer the same publishing commands and feature set. Exchanging fully formatted worksheet pages among Releases 2.3, 3.1, and *Windows* should no longer be difficult.

IS WINDOWS A BETTER CHOICE?

The trade-offs for Release 3.1 Plus's extra capabilities are slower performance and a heavier memory requirement. You really need a 2MB system to get Release 3.1 Plus running, and 3MB memory to use the Solver. Since the program runs in protected mode (using a *Windows*-compatible DOS extender), you'll also need a 286 processor or higher. In other words, the requirements are about the same as for *1-2-3 for Windows*.

Our performance tests show Release 3.1 Plus to be a moderately slower calculator than Release 2.3 but faster on most measures than *1-2-3 for Windows*.

Assuming the computing world continues its rush into *Windows*, we'd say *Lotus 1-2-3 for DOS*, Release 3.1 Plus, seems destined for a niche role. It's not likely to be the power user's first choice, but its compatibility with Release 2.3 makes it ideal for DOS-based 1-2-3 users with very sophisticated spreadsheet needs.

Lotus 1-2-3 for Windows



by Craig Stinson

You don't need a nonlinear optimizer to figure out that the one thing Lotus Development Corp. had to get right with *Lotus 1-2-3 for Windows* was compatibility with the *Lotus 1-2-3 for DOS* versions; and Lotus has done it. To ease your transition from character-mode versions of 1-2-3 to



Lotus 1-2-3 for Windows, Version 1.0
Lotus Development Corp., 55 Cambridge
Pkwy., Cambridge, MA 02142; 617-577-8500.
List Price: \$595.

Requires: 2MB RAM (4MB recommended),
Microsoft Windows 3.0 or later, DOS 3.0 or
later. Mouse recommended.

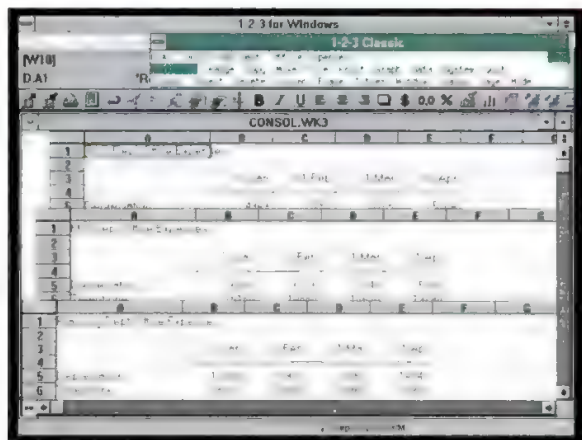
In Short: Émigrés from *Lotus 1-2-3's* DOS
versions will appreciate *Lotus 1-2-3 for
Windows*' keystroke, macro, and file
compatibility with Release 3, as well as the
customizable palette of mouse shortcuts for
everyday spreadsheet operations. But 1-2-3
for *Windows* is slow, uses the *Microsoft
Windows* interface in nonstandard ways, and
has many bugs.

CIRCLE 403 ON READER SERVICE CARD

the new \$595 graphical model, Lotus just imported the Release 3.1 Plus menu tree. Press a slash or colon in *1-2-3 for Windows* and you get a movable window titled 1-2-3 Classic. Here you can ply the familiar 1-2-3 and WYSIWYG menus, just as though you had never left home.

Of course, you can also operate *1-2-3 for Windows* with *Microsoft Windows*-style pull-down menus and some rather unconventional *Windows* dialog boxes. Practically every item on the Classic menu trees has a counterpart somewhere on the *Windows* menu system (and you can learn the corresponding procedures by highlighting a Classic command and pressing F1). So in theory, you can be productive in *1-2-3 for Windows* from day one with the Classic menus and add *Windows* commands to your repertoire as you go.

More important, perhaps, is the fact that most of your Release 2.x and Release 3.x macros will run correctly in the new environment. The macro compatibility issues in *1-2-3 for Windows* are few and minor: Backslash macros have to be run with Ctrl instead of Alt because *Windows* reserves the Alt key for menu access. Macros that depend on fixed screen dimensions may behave a little differently in an environment offering sizable windows, and a few Classic menu commands (such as /System) are inoperative in 1-2-3



Lotus 1-2-3 for Windows' SmartIcon palette reduces commonplace tasks to single mouse clicks, and the Classic menu window eases the transition from 1-2-3's DOS versions.

for Windows. Macro calls to nonfunctional commands are treated as no-ops and do no harm, but such calls will have to be rewritten before they'll do what they used to do.

SMARTICONS: ONE-CLICK WONDERS

The other major asset of *1-2-3 for Windows* is its SmartIcon palette. This is a customizable, movable toolbar full of mouse shortcuts for everything you do most often in a spreadsheet program. With SmartIcons, everyday maneuvers such as formatting, adding, copying, saving, and retrieving can all be simple mouse operations. You can delete the icons you don't need, add ones that Lotus didn't know you needed, attach macros to buttons (with a few limitations), and even design your own icons. SmartIcons are also a prominent feature in Lotus's new word processor, *Ami Pro*, Version 2.0, and you can expect to see them across the new Lotus Windows-based product line soon.

1-2-3 for Windows' charting component also makes some advances over Release 3.1 Plus. The program now includes 3-D bar, line, area, and pie charts. From the standpoint of user convenience, a very welcome change is that graphs are now automatically named (and saved as part of the .WK3 file) as they are created. A handy table command, comparable to /RNT, creates a three-column listing of all of a worksheet's graph names, types, and titles. *1-2-3 for Windows* permits graphs (and CGM and metafile clip art) to be embedded within a worksheet, following the conventions of the Release 3.1 Plus

WYSIWYG add-in.

Elsewhere, the news is somewhat disappointing. Aside from DDE support (OLE will be supported in the next formal release) and the aforementioned graphics improvements, *1-2-3 for Windows* is a rather rushed transplant of Release 3.1 Plus into the Windows environment. Performance is slow. *1-2-3 for Windows* uses lots of memory, and it has display and other bugs.

On our tests, *1-2-3 for Windows* turned in recalc times comparable to those of Release 3.1 Plus, but it

was considerably slower than its DOS counterpart at table update and sorting. Its chart-printing performance was dismal. Screen response during range selection is poky, and the program takes an inordinate amount of time to load itself.

Lotus says you can run *1-2-3 for Windows* with 2MB of available memory. That's in addition to whatever you want to allocate to a disk cache, so you should figure on a 3MB or preferably 4MB system to run well. Starting the program in Windows 3.0 will knock your system resources down to about 45 percent; running *Ami Pro* at the same time will put you in the highly fragile under-30-percent range. Adding memory to your system won't alleviate the resource crunch, but *Windows* 3.1 will, so you can expect this

problem to be much less severe in 1992.

If you're accustomed to using other Windows applications (including others from Lotus), you may be surprised by the way the interface is implemented in *1-2-3 for Windows*. Here you'll find sets of radio buttons with none selected, check boxes where a filled box means nothing, list boxes in which the Spacebar doesn't select, and assorted other anomalies. In general, Lotus has decided to use dialog boxes only as submenus, not to provide feedback about current settings.

CLIPBOARD CONCERNS

More disturbing is the way *1-2-3 for Windows* uses the Clipboard. If you use Edit Cut and Edit Paste to move cells, the program updates all relative references in the original cells. This type of move operation has no counterpart in the Classic menu and will probably cause unwary

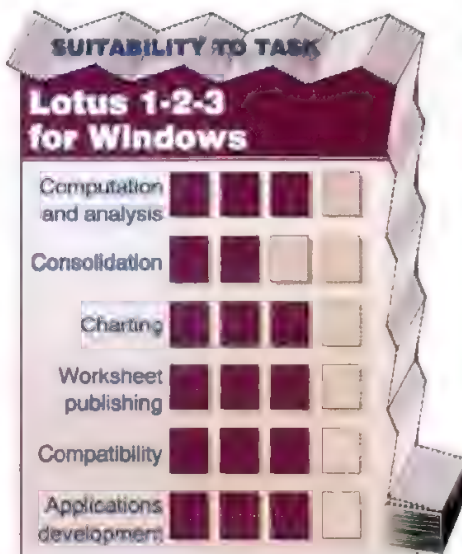
A major asset of

Lotus 1-2-3 for

Windows is its

customizable

SmartIcon palette.



users to scramble their worksheets. (A separate Move Cells command works like the Classic /M but doesn't permit moves between worksheets.)

If you use Edit Copy and Edit Paste on formulas that contain only local references, *1-2-3 for Windows* updates cell references just as it would with /Copy. If you do this with formulas containing external references, however, it treats those references as absolute, regardless of how they're written. And if you copy a single external-reference formula into a range of cells, your references are given absolute treatment in the first target cell and relative treatment in each of the others.

Lotus has indicated no plans to address these issues. The company has said that it corrected some problems in the copies of *1-2-3 for Windows* that began to leave the factory in early October, after we received the copy for this review. These changes should fix transient display bugs and problems with the Transcript facility, and should add import for *Excel* 3.0 files. If

**Why Is Northgate Going Public
With Confidential Information?**

To Illustrate The Northgate



Take a behind-the-scenes look at Northgate quality.

It's no secret that Northgate makes some of today's finest computer systems. A room full of awards from major industry publications is proof of that. But the tour you're about to take will show you how Northgate achieved its worldwide reputation for quality.

The reason we're "going public" with this information is simple. People who already own a Northgate system know from experience that we make no compromises on quality. Now we want the rest of the world to know about the qualities that made Northgate a leading direct marketer of high-quality systems.

Complete line of systems.

- **Latest technology.** The Northgate systems you buy today won't become obsolete tomorrow.

- **Complete product line.** From lightweight notebooks to giant network file servers, Northgate makes a complete range of computers to handle every business application. Our newest products include low-priced 386SX™, 386 and 486™ systems.
- **Award-winning performance.** Our most recent triumphs include *InfoWorld* and *BYTE* magazines' "Desktop Computer of the Year" awards, seven *PC Magazine* Editors' Choice awards, eight *Computer Shopper* Best Buy and three other *InfoWorld* recognitions are added proof of Northgate quality.
- **Customized, ready-to-run systems.** Northgate custom configures every system to meet your specific requirements. We'll even rack mount or hard case your systems.
- **Finest components.** We test and use components from only the best manufacturers to ensure peak performance and reliability.

- **Flawless software compatibility.** Our systems are fully compatible with MS-DOS®, OS/2®, Novell® and other operating systems.
- **Product testing and burn-in** ensures your system will work perfectly from day one.
- **All systems are FCC Class B Certified** for home and office use.

Network solutions.

- **Northgate LAN specialists** are uniquely qualified to configure and install high quality products that provide a solid foundation for networking.
- **Novell Certified Gold Dealer.** We certify and test all products to work perfectly with Novell as well as OS/2, SCO/UNIX® and Banyan® Vines. And our staff of Certified NetWare® Engineers will help keep your LAN operating at peak efficiency.



Commitment To Quality.



Customer service and support ensures your complete satisfaction.

- 24-hour toll-free technical support 365 days a year, for as long as you own your system.
- Free year of on-site service provided by NCR®. Your complete satisfaction is our commitment. If necessary, we'll even send a skilled technician to your home or office.
- Free overnight shipment of replacement parts to minimize computer downtime.
- 30-day money-back guarantee safeguards your purchase decision.
- Full parts and labor warranties — 1 year on systems, 5 years on keyboards.
- Customized service and support plans for corporate customers. Whatever you need in the way of service, Northgate delivers. We offer a variety of customized service options including disaster recovery planning.

Affordable quality is yours with Northgate.

- Low Factory-Direct Prices.
- GSA/Government and VAR discounts.
- Leasing plans with low monthly installments and flexible terms up to five years.
- 100% financing with Northgate's Big 'N' Card. We can usually set up your account the same day you call.
- Other convenient payment options include MasterCard, VISA, American Express and Discover cards, wire transfers, personal and corporate checks, Corporate Purchase Orders and C.O.D.

Our promise: no compromises.

As you're about to see, our reputation for quality is built on a solid foundation of superior design, engineering, manufacturing, and service.

Turn the page to begin your tour of Northgate.

CALL TOLL-FREE 800-828-6125



"Smart Tools For Business"™

7075 Flying Cloud Drive, Eden Prairie, MN 55344



Quality Through Engineering

Manufacturing high-performance, quality systems takes more than just a top-notch Research and Development team. It requires a strategic alliance with the industry's premier component vendors. To meet our rigid standards, Northgate engineers work in tandem with our suppliers to design a full range of components. Then, they test hundreds of configurations to find the optimum combination of performance and reliability.

Throughout the entire vendor relationship, Northgate uses sophisticated failure analysis techniques (including microphotography) and statistical process control methods to ensure our suppliers consistently produce high quality componentry.

New Northgate 386 and 486® Systems



Northgate 386SX™/16 or 20

- Intel® 80386SX 16 or 20 MHz Processor
- 1MB RAM (Expands to 16MB)
- 52MB IDE Hard Drive with 17 ms Seek Time
- Five-Bay Case, Three 5.25" and Two 3.5" Bays
- Six 16-Bit Expansion Card Slots
- Choice of 1 2MB 5.25" or 1.44MB 3.5" Floppy Drive
- Exclusive *OmniKey*® Keyboard
- VGA 800 x 600 Card and Color Monitor
- MS-DOS 3.3, 4.01 or 5
- FCC Class B Certified

\$1599⁰⁰/\$1699⁰⁰



Northgate 386DX/25 or 33

- Intel 80386DX 25 or 33 MHz Processor
- 2MB RAM (Expands to 32MB)
- 52MB IDE Hard Drive with 17 ms Seek Time
- 64K Cache
- Choice of 1 2MB 5.25" or 1.44MB 3.5" Floppy Drive
- Six 16-Bit and Two 8-Bit Expansion Card Slots
- Five-Bay Case, Three 5.25" and Two 3.5" Bays
- Exclusive *OmniKey* Keyboard
- VGA 800 x 600 Card and Color Monitor
- Microsoft® Windows™ 3.0 and Mouse
- MS-DOS 3.3, 4.01 or 5
- FCC Class B Certified

\$2099⁰⁰/\$2199⁰⁰



Northgate 386DX/40

- AMD 386DX 40 MHz Processor
- 4MB RAM (Expands to 32MB)
- 52MB IDE Hard Drive with 17 ms Seek Time
- 64K Cache
- Choice of 1 2MB 5.25" or 1.44MB 3.5" Floppy Drive
- Six 16-Bit and Two 8-Bit Expansion Card Slots
- Five-Bay Case, Three 5.25" and Two 3.5" Bays
- Exclusive *OmniKey* Keyboard
- VGA 800 x 600 Card and Color Monitor
- Microsoft Windows 3.0 and Mouse
- MS-DOS 3.3, 4.01 or 5
- FCC Class B Certified

\$2399⁰⁰

Quality Through Compatibility

Once our components meet our highest expectations, a different set of engineers takes the helm. System configurations are set up on our own LAN test bed and undergo a grueling month-long battery of tests. We check hundreds of business software packages to ensure our systems run applications under MS-DOS®, OS/2®, Novell®, SCO/UNIX®, Banyan® and other operating systems.

Through this process, Northgate has earned an industry-wide reputation for flawless compatibility. Be assured that when you purchase Northgate systems, you're getting compatibility you can rely on.

CALL TOLL-FREE 800-828-6125



Northgate SlimLine® Scalable Processing (SP) Upgradable Systems



Northgate SlimLine SP™ 386/25 or 33

- Intel 80386DX/25 or 33 MHz Processor on Power Module
- Fast, Affordable Upgrades — Simply Replace Power Module
- 4MB RAM; Expands to 32MB
- 52MB IDE Hard Drive with 17 ms Seek Time
- 64K Cache Memory
- Continuous Edge Graphics Chip
- 1.2MB 5.25" and 1.44MB 3.5" Floppy Drives
- Exclusive *Omnitree* Keyboard
- VGA 1024 x 768 Color Monitor
- Microsoft Windows 3.0 and Mouse
- MS-DOS 3.3, 4.01 or 5
- FCC Class B Certified

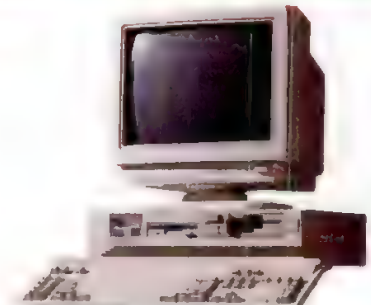
\$2799⁰⁰/\$3099⁰⁰



Northgate SlimLine SP 486SX/20

- Intel 80486SX 20 MHz Processor on Power Module
- Fast, Affordable Upgrades — Simply Replace Power Module
- 4MB RAM; Expands to 32MB
- 52MB IDE Hard Drive with 17 ms Seek Time
- 64K Cache Memory
- Continuous Edge Graphics Chip
- 1.2MB 5.25" and 1.44MB 3.5" Floppy Drives
- Exclusive *Omnitree* Keyboard
- VGA 1024 x 768 Color Monitor
- Microsoft Windows 3.0 and Mouse
- MS-DOS 3.3, 4.01 or 5
- FCC Class B Certified

\$3149⁰⁰



Northgate SlimLine SP 486DX/33

- Intel 80486DX 33 MHz Processor on Power Module
- 4MB RAM; Expands to 32MB
- 52MB IDE Hard Drive with 17 ms Seek Time
- 64K Cache Memory
- Continuous Edge Graphics Chip
- 1.2MB 5.25" and 1.44MB 3.5" Floppy Drives
- Exclusive *Omnitree* Keyboard
- VGA 1024 x 768 Color Monitor
- Microsoft Windows 3.0 and Mouse
- MS-DOS 3.3, 4.01 or 5
- FCC Class B Certified

\$3329⁰⁰

Quality Through Manufacturing

Northgate has studied manufacturing methods and has selected a process that gives the greatest quality and productivity.

Our technicians are skilled in all phases of manufacturing. Working in teams of four, they bring the elements of quality together with craftsmanship that knows no equal. A detailed system of checks and balances ensures strict adherence to our rigid quality control standards. When all is complete, comprehensive burn-in and final testing begin.



Northgate Elegance Scalable Processing (SP) Upgradable Systems



Northgate Elegance SP™ 386/25 or 33

- Intel 80386DX 25 or 33 MHz Processor on Power Module
- Fast, Affordable Upgrades—Simply Replace Power Module
- 4MB RAM (Expands to 32MB)
- 106MB IDE Hard Drive with 17 ms Seek Time
- 64K Cache Memory
- Desktop Case
- 1 2MB 5.25" and 1 44MB 3.5" Floppy Drives
- Exclusive *OmniKey* Keyboard
- VGA 1024 x 768 Card and Color Monitor
- Microsoft Windows 3.0 and Mouse
- MS-DOS 3.3, 4.01 or 5
- FCC Class B Certified

\$3299⁰⁰/\$3399⁰⁰



Northgate Elegance SP 486SX/20

- Intel 80486SX 20 MHz Processor on Power Module
- Fast, Affordable Upgrades—Simply Replace Power Module
- 4MB RAM (Expands to 32MB)
- 106MB IDE Hard Drive with 17 ms Seek Time
- 64K Cache Memory
- Desktop Case
- 1 2MB 5.25" and 1 44MB 3.5" Floppy Drives
- Exclusive *OmniKey* Keyboard
- VGA 1024 x 768 Card and Color Monitor
- Microsoft Windows 3.0 and Mouse
- MS-DOS 3.3, 4.01 or 5
- FCC Class B Certified

\$3699⁰⁰



Northgate Elegance SP 486DX/33

- Intel 80486DX 33 MHz Processor on Power Module
- 4MB RAM (Expands to 64MB)
- 106MB IDE Hard Drive with 17 ms Seek Time
- 64K Cache Memory
- Vertical Power Case
- 1 2MB 5.25" and 1 44MB 3.5" Floppy Drives
- Exclusive *OmniKey* Keyboard
- VGA 1024 x 768 Card and Color Monitor
- Microsoft Windows 3.0 and Mouse
- MS-DOS 3.3, 4.01 or 5
- FCC Class B Certified

\$3999⁰⁰

Quality Through Service

Northgate backs every system with an award-winning package of service and support. Including a 30-Day Money-Back Guarantee, full parts and labor warranties (one year on systems, five years on keyboards) and free overnight shipment of replacement parts.

You also get toll-free technical support 24 hours a day, seven days a week. We track every detail concerning your system, including configuration, **NCR** previous questions and correspondence. This gives our staff immediate access to your system's history the moment you call. Should you require on-site help, we'll dispatch a trained NCR® technician to your door. This service is free for one year.

CALL TOLL-FREE 800-828-6125



Northgate "Specialty" Systems



Northgate Elegance 486/25 or 33 EISA

- Intel 80486DX 25 or 33 MHz Processor
- 4MB RAM (Expands to 32MB)
- 200MB IDE Hard Drive with 15ms Seek Time
- 128K Cache
- EISA Bus
- 1.2MB 5.25" and 1.44MB 3.5" Floppy Drives
- Vertical Power Case
- Exclusive OmniKey Keyboard
- VGA 1024 x 768 Card and Color Monitor
- Microsoft Windows 3.0 and Mouse
- MS-DOS 3.3, 4.01 or 5
- FCC Class B Certified

\$4599⁰⁰/\$5599⁰⁰



Northgate SlimLite™ 386SX/20

- Intel 80386SX 20 MHz Processor
- 1MB RAM (Expands to 5MB)
- 40MB Hard Drive
- 1.44MB 3.5" Floppy Drive
- 84-Key keyboard Emulating 101
- 8.5" LCD Screen supports 32 Shades of Gray VGA 640 x 480
- 11.7" x 8.25" x 1.9" 6.1 Lbs
- AC Adapter
- Stacker™ Software Provides up to 80MB of Storage
- Magic Cursor™ for Windows or No-Squint II™ for DOS
- MS-DOS 4.01 or 5
- FCC Class B Certified

\$2399⁰⁰



Northgate OmniArray™

- RAID-3 Parallel Drive Array with 1.1GB to 4GB Data Storage
- Four Data Drives with 512K Total Cache, One Redundant Drive with 128K Cache
- Fast SCSI Engineering Delivers 16MB/Second Performance
- ISA/EISA SCSI Adapter for NetWare® File Servers
- Novell Certified for NetWare 386 3.11
- Failed Drive Supports Keeps Unit Operational with Single Drive Failure, Rebuilds Data on Replacement Drive
- SCSI Cable and Terminator
- Vertical Power Case

Call For Pricing

Quality Custom Configurations



Northgate custom configures every system to meet your most demanding needs. We offer a comprehensive range of top quality components, giving us the capability of tailoring a system over 3,000,000 ways. To find out which is best for you, call one of our Systems Consultants toll free.

Hard Drives

Options include IDE hard drives with capacities of 52MB, 100MB, 200MB or 340MB. Also available are ESDI and SCSI hard drives with capacities as high as 1.2GB. Call for other drive size options.

Memory Expansion

Northgate systems have a variety of memory expansion capabilities. Our Systems Consultants can help you decide how much memory you need for both current and future applications.

Monitors

Northgate offers 12" VGA monochrome, 14" monochrome (amber), 14" VGA monochrome, 14" VGA color, 16" VGA color and 19" VGA color monitors. Resolutions include 640 x 480, 800 x 600, 1024 x 768, and 1280 x 1024. NEC 15", 17" and 21" flat-screen, low-radiation monitors also available.

Math Coprocessors

Speed up processor-intensive business applications with an Intel or Weitek® math coprocessor. A Northgate Systems Consultant can help you select the right one for your system.

Tape Backups

To protect your valuable data, Northgate offers an array of high-speed tape backup devices. Choose internal or external designs in the following capacities: 40/120MB, 80/304MB, 80MB, 150MB, 300MB and 1.3GB.

Communications

Northgate has the right equipment to link your system to other computers or fax machines. Products include internal and external MNP-5 modems in 2400 and 9600 baud speeds. Also available is Northgate FaxIt for Windows, a revolutionary fax card designed to work from within your Microsoft Windows applications.

Printers

The best thing to have beside your computer is a printer from Northgate. Printer options include low-cost 9-pin and 24-pin dot matrix printers as well as laser printers and PostScript-compatible laser printers for the very best print quality.

Floppy Drives

Floppy drive options include 5.25" models in 360K and 1.2MB designs and 3.5" models with capacities of 720K and 1.44MB.

CD-ROM & Other Hardware

We can also configure your Northgate system with many other hardware options, including CD-ROM drives, high end video cards, and I/O cards. Call and ask a Northgate Systems Consultant for the latest options and prices.



**CALL TOLL-FREE
24 HOURS EVERY DAY 800-828-6125**

Major corporations, volume purchasers and government agencies call National Business Accounts: **800-545-6065**

Fax your order! 800-323-7182

Notice to the Hearing Impaired: Northgate has TDD capability. Dial 800-535-0602.



"Smart Tools For Business"™

7075 Flying Cloud Drive, Eden Prairie, Minnesota 55344

Northgate OmniKey Keyboards — Quality Designs No System Should Be Without!



OmniKey/101NI

- 12 F-Keys On Top
- Alps Click/Tactile Key Switches
- Independent Inverted T Cursor Control And Numeric Keypads
- Rate Select From 3-120 CPS
- Period/Comma Lock Key Locks out < > Even When Shifted
- Interchangeable CTRL, ALT, CAPS LOCK Keys
- Unmatched IBM® Compatibility
- FCC Class B Certified

\$89⁰⁰



OmniKey/102

- 12 F-Keys On Left
- Alps Click/Tactile Key Switches
- Independent Inverted T Cursor Control And Numeric Keypads
- Rate Select From 3-120 CPS
- Period/Comma Lock Key Locks out < > Even When Shifted
- Interchangeable CTRL, ALT, CAPS LOCK Keys
- Unmatched IBM Compatibility
- FCC Class B Certified

\$89⁰⁰



OmniKey/ULTRA

- 12 F-Keys On Left And Top
- Alps Click/Tactile Key Switches
- Independent Inverted T Cursor Control And Numeric Keypads
- Rate Select From 3-120 CPS
- Period/Comma Lock Key Locks out < > Even When Shifted
- Interchangeable CTRL, ALT, CAPS LOCK Keys
- Unmatched IBM Compatibility
- FCC Class B Certified

\$129⁰⁰

Copyright Northgate Computer Systems, Inc. 1991. All rights reserved. Northgate, OmniKey, Elegance, OmniArray, SlimLine, SlimLite and the Northgate "N" logo are trademarks or registered trademarks of Northgate Computer Systems. 80386SX, 80486SX, 80486 and the Intel Inside logo are trademarks of Intel. IBM is a registered trademark of International Business Machines Corp. MS-DOS, Microsoft, Windows and OS/2 are trademarks or registered trademarks of Microsoft Corporation. All other products and brand names are trademarks and registered trademarks of their respective companies. Prices and specifications subject to change without notice. Northgate reserves the right to substitute components of equal or greater quality or performance. All items subject to availability. We support the ethical use of software. To report software copyright violations, call the Software Publishers Association's Anti-Piracy Hotline at 1-800-388-PIRX.

CIRCLE 368 ON READER SERVICE CARD

CODE A1422



PERFORMANCE TESTS: SPREADSHEETS

The results of PC Magazine Labs' nine spreadsheet performance tests appear on the following pages, and the charts are divided into three categories: maintenance chores, mathematical tasks, and miscellaneous functions. We discovered that *Microsoft Windows*-based spreadsheets are not necessarily slower than their DOS-based competitors, and some packages are more likely than others to speed up significantly when a math coprocessor is installed.

WHAT THE NUMBERS MEAN

The *Microsoft Windows*-based spreadsheet *Wingz*, Version 1.1a, was the top performer, ranking among the top three packages on seven out of nine tests. On our Screen Refresh test, *Wingz* tied for second place in graphics mode with *Lotus 1-2-3 for DOS*, Release 2.3, although it could not keep pace with the products that have a text mode. *Microsoft Excel* fared almost as well, though its Load from Disk and Save to Disk times were relatively slow. It should be noted that *Wingz* benefits from its ability to link files in memory, while the other products link files on-disk.

Lucid 3-D turned in mixed performance results, placing first on four tests, but almost as often trailing behind the other products. Its forte is academic math rather than general business functions. *Lucid* was over ten times as fast as the other pack-

ages (except *Excel*) on the Mathematical Worksheet Recalculation test, but it could not perform the Sensitivity Analysis Recalculation test, and it turned in the slowest times on the Financial Worksheet Recalculation and Database Sort tests.

Quattro Pro was surprisingly slow in processing our financial worksheet when tested without a math coprocessor. With a coprocessor installed, however, *Quattro Pro*'s performance improved dramatically. On the combined Net Present Value and Internal Rate of Return calculations, *Quattro Pro* shaved 25 seconds off its noncoprocessed times, moving it from second-to-last place to second place, behind *Excel* and *Lotus 1-2-3 for DOS*, Release 2.3, which tied for first. Of all of the products tested, *Quattro Pro* made the best use of a math coprocessor, often reducing its timings

by 75 percent or more. *InstaCalc* and *Lucid* clearly do not take advantage of a math coprocessor, and the chip installed had little impact on *Wingz* or *Excel*.

The poorest performer was *Lotus 1-2-3 for Windows*. Except on the Financial Worksheet Recalculation test, where it came in third, *1-2-3 for Windows* ranked in the bottom half of the group, and it placed last or next to last on five out of the nine tests. On Chart Printing, *1-2-3 for Windows* took over 5 minutes to print a bar chart that *Excel*, *Wingz*, and surprisingly, *Lotus 1-2-3 for DOS*, Release 3.1 Plus, could print in about 25 seconds.

Lotus Development Corp.'s fastest spreadsheet is *1-2-3 for DOS*, Release 2.3. This upgrade to the classic *Lotus 1-2-3* spreadsheet can still hold its own against the competition, but its foothold is getting slippery.

HOW WE TESTED

We tested the spreadsheets on a Compaq Deskpro 386/25e equipped with a 300MB hard disk and 8MB of extended RAM. The hard disk was formatted under DOS 4.01 and divided into two 150MB partitions. The test files and DOS were stored on the C: drive, and the spreadsheets were installed on the D: drive, which was reformatted for each product. The SHARE.EXE file was loaded, and the CONFIG.SYS and

AUTOEXEC.BAT files were suggested by the vendors. Compaq DOS memory managers were permitted in the configuration, but disk caches were not.

We configured a second machine with an Intel 80387 math coprocessor and repeated all of the tests that employed floating-point operations. Charts were printed with an HP LaserJet III.

Our test files were prepared in .WK1

file format and imported into each product. Before the testing began, formulas were converted to each program's preferred syntax, and the files were saved in the program's native file format. In all cases, worksheets were set for manual recalculation. Unless otherwise noted, the timing ended when control was returned to the keyboard.

CONTINUES

you bought the product before early October, you should contact Lotus for information about obtaining these corrections.

The fact that *1-2-3 for Windows* has keystroke and file compatibility with *1-2-3*'s DOS versions guarantees a fairly smooth transition for first-time *Windows* spreadsheet users. SmartIcons and some gorgeous aesthetics also make upgrading attractive. Given Lotus's huge base of users, knowledge, applications, and supporting products, that may be enough. But *Lotus 1-2-3 for Windows*' shortcomings,

coupled with Lotus's haste to get it into *Windows*, leave the spreadsheet lagging behind Microsoft's more mature *Excel*.

**Lucid 3-D**

by Bruce Brown

Lean and mean, DacEasy's \$49.95 *Lucid 3-D*, Version 2.2, has several outstanding features, including the fastest mathematical recalculation times in this evaluation,

quick changes between spreadsheet levels, and good memory swapping for TSR operation.

Lucid 3-D is somewhat ambiguously named since it doesn't create true three-dimensional worksheets. The basic *Lucid 3-D* spreadsheet is a 2-D, text-mode spreadsheet with up to 254 columns and 9,999 rows. The 3-D part of the product's name comes from its ability to have any cell in a spreadsheet be a key to access a hierarchical nest of other spreadsheets. Ranges can't be defined or formatted in

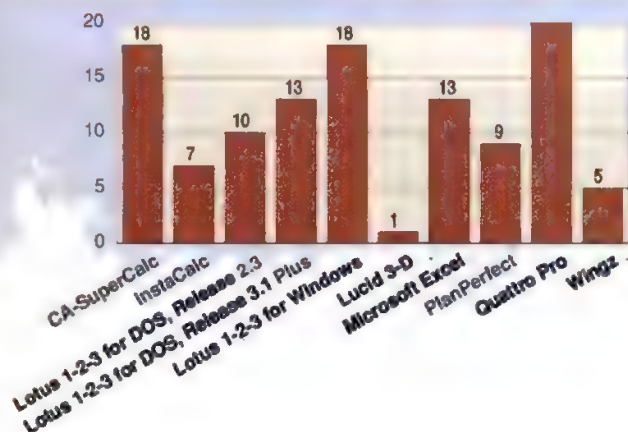
PERFORMANCE TESTS: SPREADSHEETS

■ The **Load from Disk** test measures the time it takes to load the Mathematical Worksheet Recalculation file from disk in the program's native file format.

■ The **Save to Disk** test measures the time it takes to write the Mathematical Worksheet Recalculation file to disk in the program's native file format.

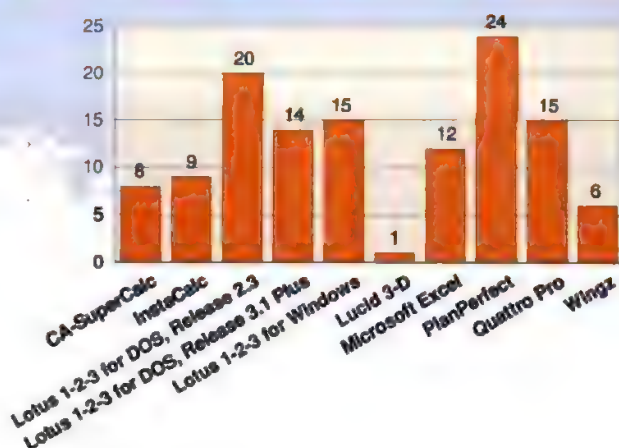
LOAD FROM DISK

Elapsed Time (seconds)



SAVE TO DISK

Elapsed Time (seconds)



Shorter bars represent better performance.

blocks, and *Lucid 3-D* spreadsheets don't resemble pages in a single worksheet. Instead, links between files are simple to set up and as many as nine spreadsheets can be displayed on the screen at one time.

A POP-UP SPREADSHEET

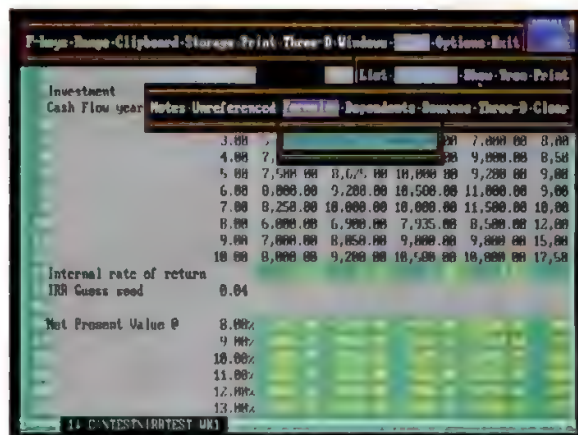
Lucid 3-D can be run either as a stand-alone program or as a TSR. If you run it in RAM-resident mode, be prepared to give up 205K of memory unless you utilize the included SWAPLC memory swapper, which automatically switches *Lucid 3-D* into available extended memory, with the residual memory demand dropping to 7K. Once you've loaded *Lucid 3-D* via SWAPLC you can quickly toggle *Lucid 3-D* in and out of memory with the Left Shift-Ctrl key combination. If you don't have extended memory, you can use SWAPLC to store the files to disk, though that slows performance.

Lucid 3-D comes with several components that are loaded individually, including a graphics component and separate conversion utilities for automatically reading and writing *Lotus 1-2-3*, *dBASE*, and other file formats. While it's nice not to

have to give up RAM or disk space to components you don't need, many users won't want the hassle, however slight, of tracking and loading separate program pieces.

The program uses top-line hierarchical menus, with successive menus dropping down in horizontal rows. While this system eats up screen space the deeper you go into menus, the advantage is that you can always look up a level to see where the current menu came from.

Lucid 3-D has a complement of 68 functions—less than many other spreadsheets. An auditing feature can list formulas and dependencies but does not track more than one circular reference. The product's data analysis functions are limited, with no what-if data tables, no regression or distribution analysis, and no solver function included.



Lucid 3-D's audit mode lists or highlights cells with notes, formulas, dependencies, unreferenced cells, and cells that have other spreadsheets attached to them.

LIMITED DATABASE TOOLS

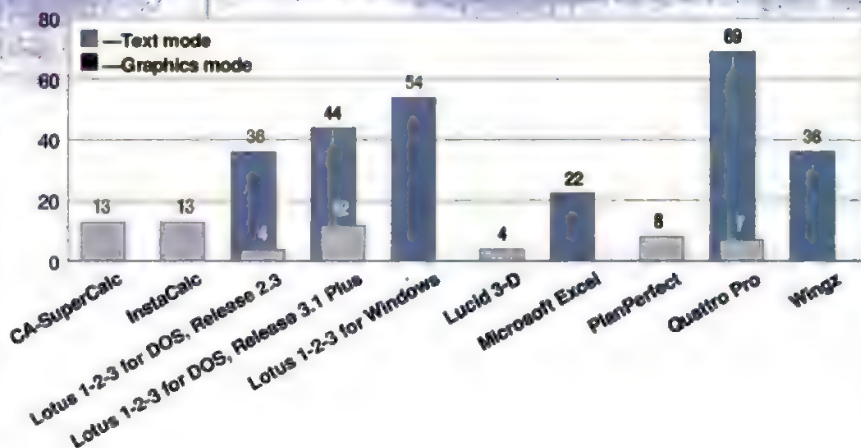
Sorting in *Lucid 3-D* is limited to two key fields in one direction at a time. You can actually sort on more than two fields if you plan carefully; since the results of previous sorts stick on successive sorts, if you work backwards by doing the least significant sorts before more significant

■ The **Screen Refresh** test measures scrolling speed. We time how long the package takes to scroll up and down 50 screens and sidescroll 10 screens. Both text and graphics modes are tested. To conduct the test, we load the Database Sort worksheet and generate macros to scroll the required number of screens.

Programs with intelligent macro interpreters that display only the final destination are scrolled manually, and therefore are incrementally timed. We position the cursor 50 screens from the top, press the PgUp key until the first cell appears, record the time, and then double it. For the sidescroll, we position the cursor ten screens to the right and hold the Ctrl-Right Arrow key combination. The procedure is repeated three times and the fastest time recorded.

SCREEN REFRESH

Elapsed Time (seconds)



CONTINUES

SUITABILITY TO TASK

Lucid 3-D

Computation and analysis	■	■	■	■
Consolidation	■	■	■	■
Charting	■	■	■	■
Worksheet publishing	■	■	■	■
Compatibility	■	■	■	■
Applications development	■	■	■	■

Lucid 3-D if you need to use a spreadsheet program to maintain databases.

Lucid 3-D doesn't have a true consolidation function, but since linking files is easy, you can use intermediate spreadsheets or ranges to gather data before linking to other summary sheets. *Lucid 3-D* is fine for creating and printing simple charts, but you can't combine charts and worksheets on the same screen or printed page, and there is no support for multiple fonts.

FAST AT SIMPLE MATH

While it's easy to identify functions that are found in more-powerful spreadsheet programs but not in *Lucid 3-D*, don't lose sight of *Lucid 3-D*'s fine functional ability in basic spreadsheet tasks.

The best of *Lucid 3-D*'s performance test results is its recalculation speed, an area in which it has long had an edge. *Lucid 3-D* also reads and writes files very quickly, a necessity when whole spreadsheets are linked to single cells. Most of the other test results were average, but in recalculating spreadsheets that had lots of basic arithmetic functions (division, multi-

sorts you can get bidirectional sorting on as many columns or rows as you'd like.

Data querying is also limited. Entering a lowercase query criterion returns both upper- and lowercase fields, while an uppercase criterion returns only uppercase entries. You can search and replace during queries, but you shouldn't consider



Lucid 3-D, Version 2.2

DacEasy Inc., 17950 Preston Rd., #800, Dallas, TX 75252; 800-877-8088, 214-248-0205.

List Price: \$49.95.

Requires: 256K RAM (384K for graphics), DOS 2.1 or later.

In Short: *Lucid 3-D* doesn't support true three-dimensionality, but it does switch among attached spreadsheets. The program costs just \$49.95, uses only 7K RAM as a TSR with an included memory-swapping utility, and recalculates faster than any other program.

CIRCLE 404 ON READER SERVICE CARD

plication, and so on) *Lucid 3-D* was four times as fast as *Microsoft Excel*, and ten times as fast as most. That certainly doesn't

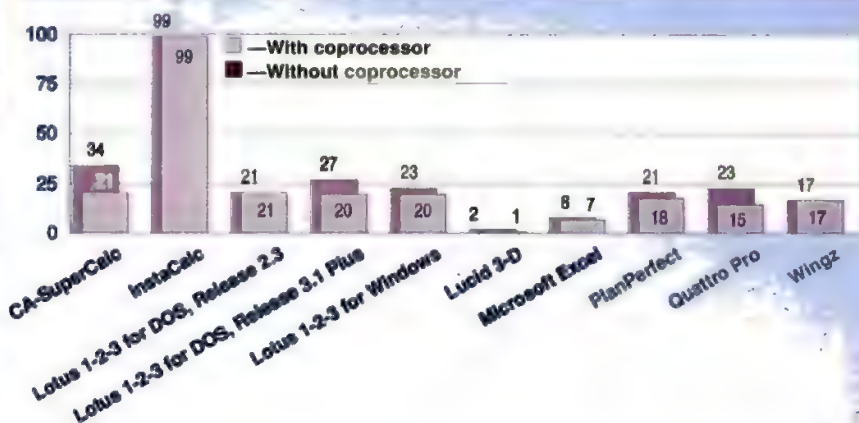
PERFORMANCE TESTS: SPREADSHEETS

■ **The Mathematical Worksheet Recalculation** test measures the time a program takes to calculate a worksheet performing 1,456 mathematical operations on the value π (addition, subtraction, multiplication, division, exponentiation, and square root). The test is run with and without a math coprocessor installed.

■ **The Financial Worksheet Recalculation** test calculates the Net Present Value (NPV) and Internal Rate of Return (IRR) for 253 different ten-year cash flows. After calculating the spreadsheet, we keep the NPV figures constant but change the iteration guess factor for the IRR functions and time the program's speed in recalculating the results. (Both calculations are shown here.) Programs that use intelligent algorithms recognize that only the IRR functions need recalculation, while others recalculate both the NPV and IRR figures. The test is run with and without a math coprocessor installed.

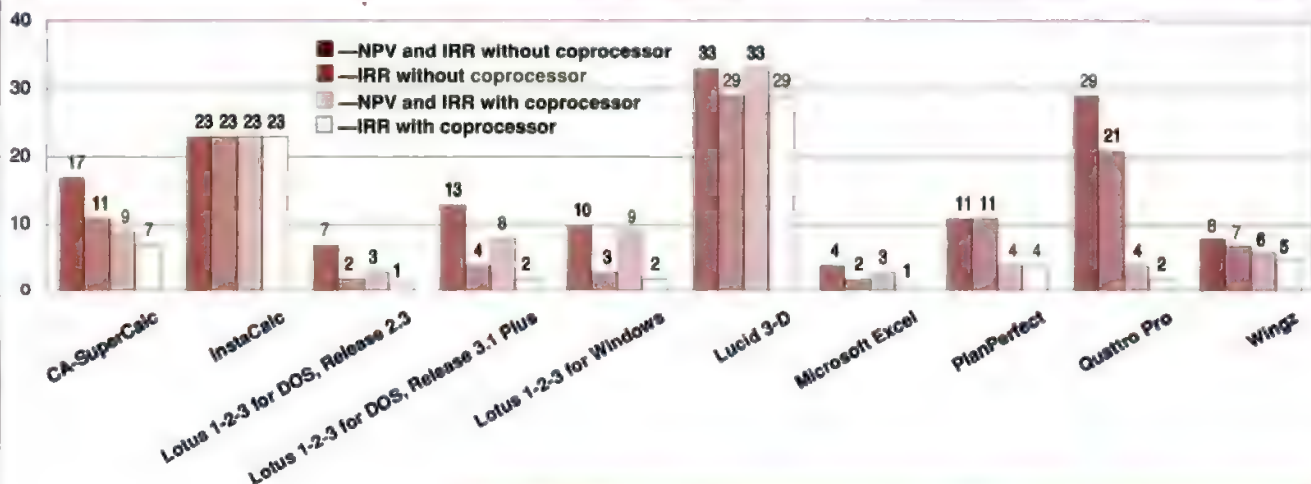
MATHEMATICAL WORKSHEET RECALCULATION

Elapsed Time (seconds)



FINANCIAL WORKSHEET RECALCULATION

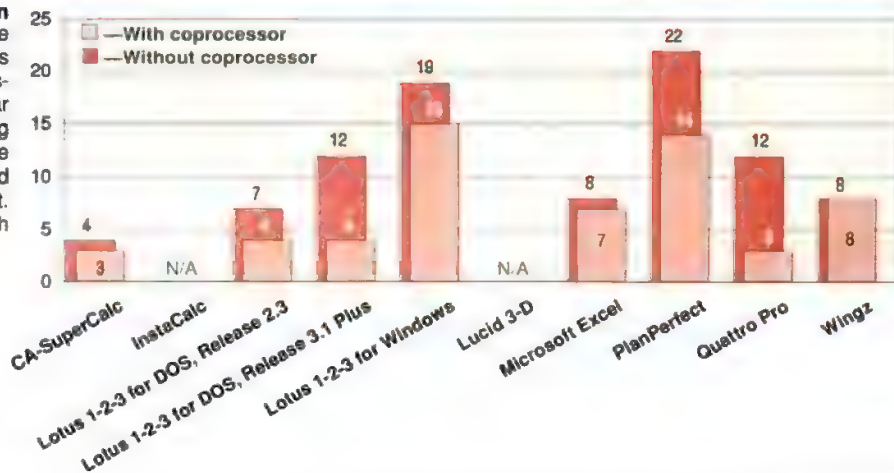
Elapsed Time (seconds)



■ **The Sensitivity Analysis Recalculation** test measures the time it takes to generate a data table ("what-if" table) of 1,000 cells based on two input variables. The test cross-tabulates monthly payments for a 30-year fixed-interest mortgage with incrementing principle and interest amounts. Principle values range from 10,000 to 2.5 million, and interest rates increase from 8 to 12 percent. The test is run with and without a math coprocessor installed.

SENSITIVITY ANALYSIS RECALCULATION

Elapsed Time (seconds)



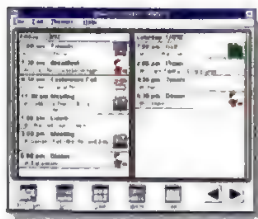
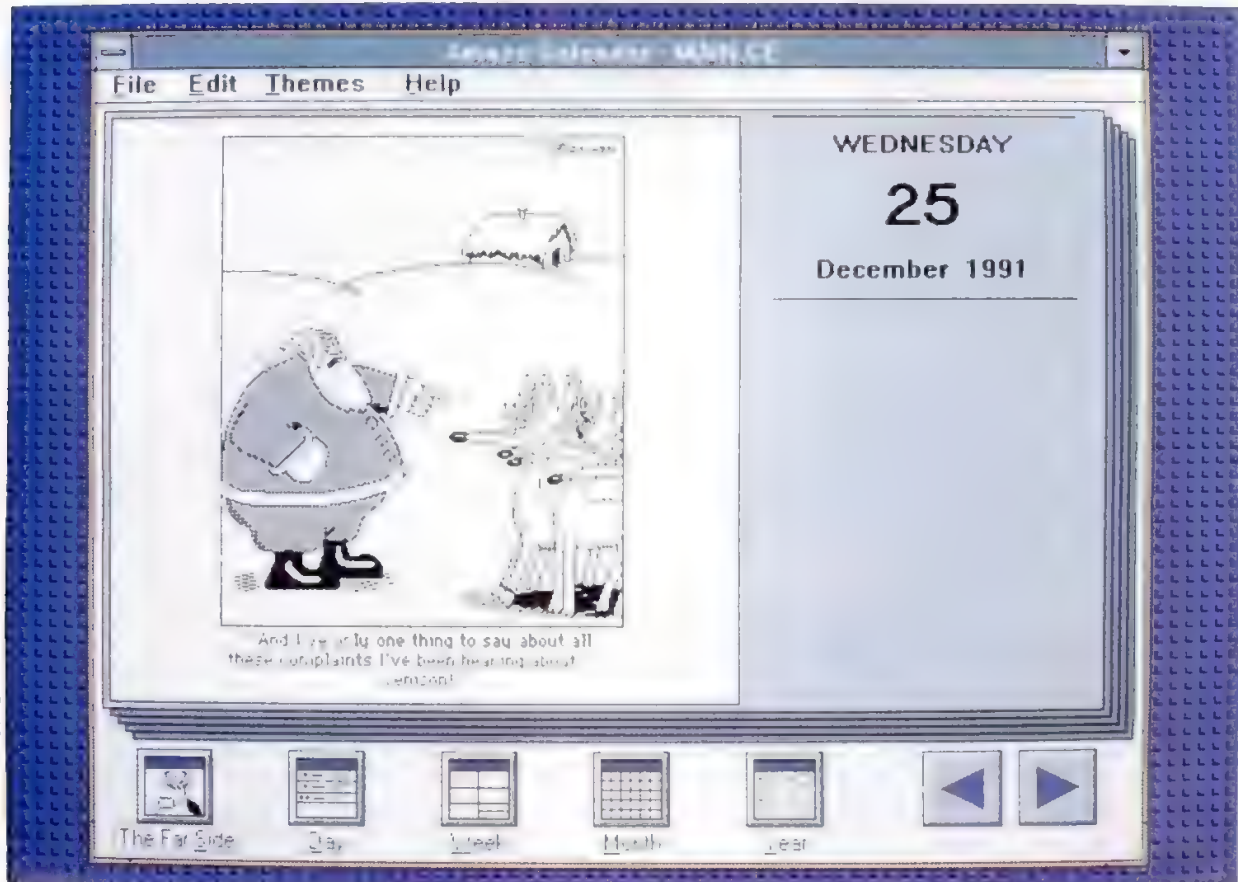
N/A—The product could not perform this test.

Shorter bars represent better performance.

CONTINUES

Buy this software or the reindeer gets it.

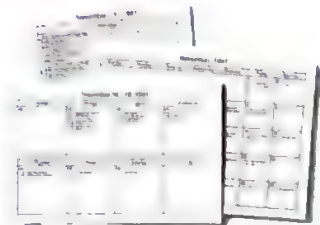
The Far Side Copyright ©1980 Chronicle Features



This full-function desktop organizer lets you keep track of your business with animated reminder icons.



Animated Far Side characters will brighten your day by making random guest appearances.



Plan your schedule by the day, week, month or year and print any view in a variety of sizes.

Now your computer can take you to The Far Side with The Far Side Computer Calendar for only \$69.95. Visit your dealer or to order, call 1-800-367-4802.

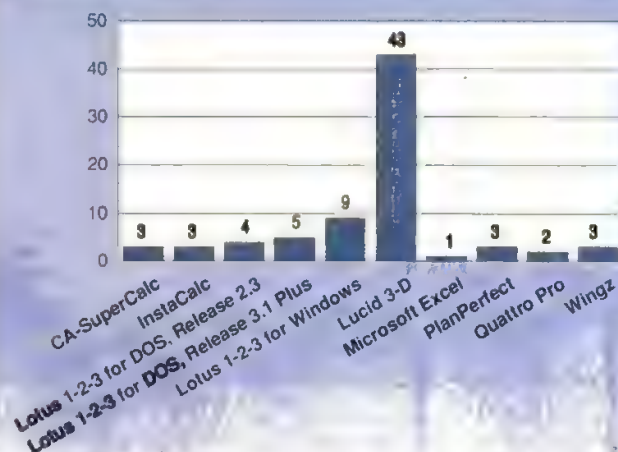


amaze

© 1991 Amaze, Inc., All Rights Reserved

PERFORMANCE TESTS: SPREADSHEETS

DATABASE SORT Elapsed Time (seconds)

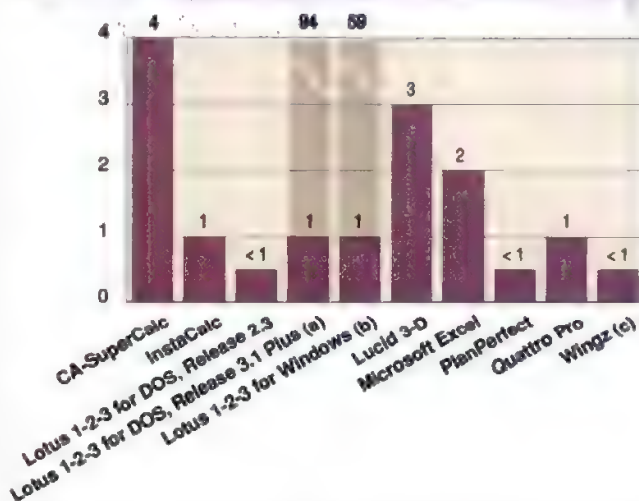


■ The **Database Sort** test times a two-level sort on a database of 1,000 rows and 10 columns. The primary field is sorted in ascending order and the secondary field in descending order. The database is predominantly numeric, with two text fields, and there are no formulas included in the data.

■ The **Link Refresh** test evaluates the efficiency of the program's linking algorithm. We link 1,000 cells in a worksheet displayed on-screen to corresponding cells in another worksheet stored on-disk. We then measure the time the package takes to refresh the references.

■ The **Chart Printing** test times how quickly the program can print a stacked-bar chart. The chart tracks monthly sales trends over a three-year period and includes a title and subtitle in different font sizes, labeled data ranges with cross-hatching and shading, and a legend. An HP LaserJet III printer is used for the test. We begin timing when the print command is initiated and end when the completed chart drops into the bin.

LINK REFRESH Elapsed Time (seconds)

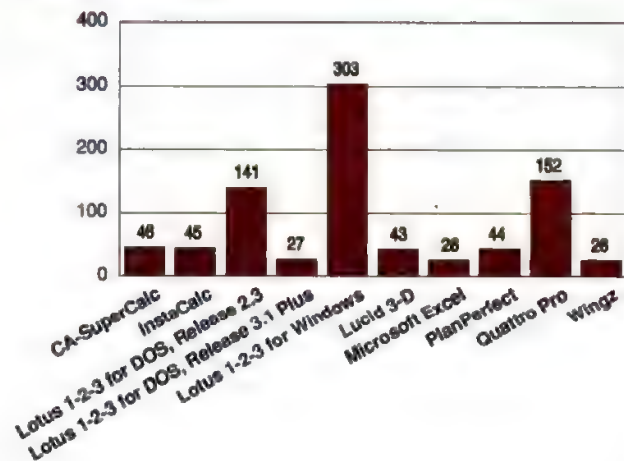


(a) Lotus 1-2-3 for DOS, Release 3.1 Plus, recalculates in the background. Keyboard control returns in 1 second, but the total time to refresh the link is actually 94 seconds.

(b) Lotus 1-2-3 for Windows recalculates in the background. Keyboard control returns in 1 second, but the total time to refresh the link is actually 59 seconds.

(c) Wingz cannot link to files on-disk, and therefore we loaded both worksheets in memory.

CHART PRINTING Elapsed Time (seconds)



Shorter bars represent better performance.

ENDS

mean *Lucid 3-D* is tops for all calculations; on tests that use financial functions (Net Present Value and Internal Rate of Return) *Lucid* was dead last.

In October, Lucid Corp., the original developer of *Lucid 3-D*, began selling a new Version 2.5 of *Lucid 3-D* for \$99.95. The new release, not available at the time of testing, is a superset of Version 2.2 and will include an improved graphics module with more chart types, chart rotation and improved views, and a lower memory requirement. Other features in Version 2.5 will include universal search-and-

replace and faster changes between spreadsheet levels. (Lucid Corp. can be reached at 800-967-5550. DacEasy will continue to sell Version 2.2.)

Lucid 3-D, Version 2.2, is a terrific spreadsheet for typical use. If you don't need WYSIWYG, heavy database management capabilities, or strong worksheet publishing features, its rapid recalculation and low cost make it very attractive. If *Lucid 3-D*'s command system were Lotus-style, this program would even be a good TSR adjunct for 1-2-3 users who want to do quick calculations.

 **Microsoft Excel**
by Craig Stinson

Through most of its history as a PC product, *Microsoft Excel* faced two major hurdles: It ran in an unpopular operating environment, and it was only partly compatible with *Lotus 1-2-3*. From the beginning, *Excel* read and wrote .WK1 files, but its look and feel were significantly different from 1-2-3's, and it did an inadequate job of translating 1-2-3 macros.



 DTK Computer

DTK 486 drives high-performance software in PC Week Labs test.

When *PC Week's* editors asked PC Week Labs to test Autodesk's® Renderman™ software, a DTK i486™ computer was chosen to run the sophisticated, high-level shading software program. (The drawing shown above is representative of the high quality of Renderman™ output.)

It takes a lot of muscle to get the full benefits of Renderman's™ power; we build that muscle into every DTK i486™ system™.



We begin with Intel's® potent i486™ processor (with its built-in cache and floating-point coprocessor circuitry) and add a second-level 64KByte static Ram cache (expandable to 256KBytes) for even

more impressive productivity levels.

Add to these your choice of hard drives and controllers, a fast graphics card and a post-VGA high definition monitor, and you have a PC screamer that can handle even the toughest of jobs ... while still affordably-priced.

When power and dependability are important, DTK is the computer of choice of people who know. Perhaps it's time you considered a DTK i486™ for your next computer. Call one of the DTK branch offices below for the name of a reseller near you.



The DTK 486 Family ■ 486-33 ISA ■ 486-33 EISA ■ 486-25 ISA ■ 486SX-20 ISA



DTK Computer Inc. A Reputation for Success.

17700 Castleton Street Suite 300 / City of Industry (Los Angeles), CA 91748 / (818) 810-8880 / FAX (818) 810-5233

Los Angeles
(818) 810-0098

San Jose
(408) 436-6363

Houston
(713) 568-6688

Chicago
(708) 593-3080

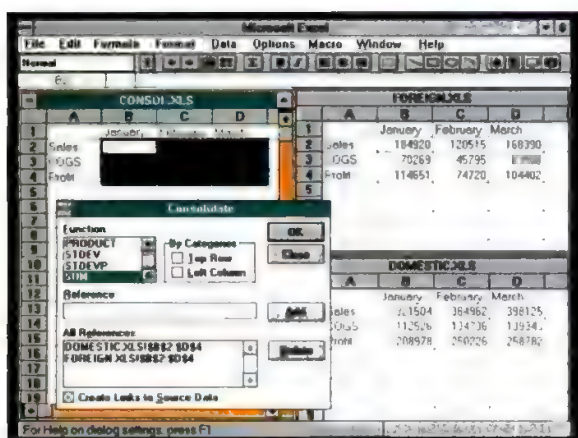
New York
(908) 562-8800

Miami
(305) 597-8888

Autodesk is a registered trademark and Renderman is a trademark of Autodesk Inc. The DTK Logo is a registered trademark of DTK Computer Inc. Intel is a registered trademark and the Intel Inside Logo and i486 are trademarks of Intel Corporation. Design and specifications subject to change without notice. ©1991. DTK Computer Inc.

CIRCLE 102 ON READER SERVICE CARD

SOFTWARE SPREADSHEETS



Microsoft Excel's Consolidate command assembles data from similar or dissimilar supporting worksheets, either with or without linking formulas.

Lately, much has changed. *Windows* is no longer the Siberia of microcomputing, and *Microsoft Excel*, Version 3.0, includes support for Lotus keystrokes and an interactive 1-2-3 help system. The new help system will describe how to perform 1-2-3 tasks in *Excel* or will execute 1-2-3 commands, with an explanation of what's happening. Either way, it reduces a high learning wall to a passable picket fence.

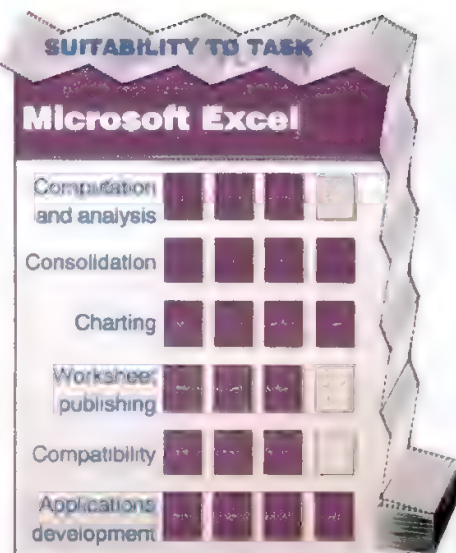
Those who choose to step over will be amply rewarded. The \$495 *Excel* 3.0 offers superb performance and the richest list of analytic, presentation, and application-development features available today. (*Excel* 2.0 earned a *PC Magazine* Editors' Choice honor when we reviewed spreadsheets in the April 24, 1990, issue.)

CONVENIENT FORMULA BUILDING

Excel provides a host of conveniences for ordinary formula building and debugging. Functions can be pasted from a menu, with or without argument placeholders, and sum functions can be entered with a mouse icon (these two conveniences are also available in *1-2-3 for Windows*). For troubleshooting, *Excel* highlights matching parentheses and lets you calculate any subexpression on the formula bar. You can also break complex formulas into smaller ones by copying or cutting portions from the formula bar to the *Windows* Clipboard. Notes can be appended to any formula and viewed in a separate window; they can also be printed as endnotes to a worksheet report. *Excel* identifies an annotated cell with a red dot and displays the annotation in response to a double click.

Excel's calculating toolkit includes functions for performing linear and nonlinear regression and trend analysis, as well as matrix arithmetic. This functionality appears in most programs as commands rather than functions; *Excel's* approach lets you analyze several sets of data on the same worksheet and see where the numbers came from. For the same reason, sensitivity tables are created by formula rather than by command.

Excel offers a variety of naming services not available in most other spreadsheet programs. Probably the most important are that individual cells within a named range can be referenced by the encompassing name and cells at the intersection of two named ranges can be identified with an intersection operator (the space character). Hence, for example, the cell at the intersection of the "January" column and the "Income" row can be referenced simply as "January Income." It's also possible in *Microsoft*



Excel to write a formula such as =SUM(MAY: OCTOBER), where May and October are separately named entities. Programs that adhere to the Lotus standard would choke on such unremarkable constructions.

To assist with worksheet organization, *Excel* includes an outliner. An outlined worksheet, like an outlined text document, lets you control the level of detail you see and provides simple ways of rearranging material.

For consolidation, *Excel* lets you work with as many files at once as your system's memory will accommodate. Unlike *1-2-3 for Windows*, *Lotus 1-2-3 3.1 Plus*, and *CA-SuperCalc*, the program does not generate three-dimensional worksheets. But it includes a workgroup mode that lets you assign formats and data at once to the corresponding cells in any number of separate files. Constellations of worksheets, chart files, and macro libraries can also be saved and loaded together as workspace files.

Excel also has a Consolidate command that can roll up subsidiary sheets, whether or not those sheets are similarly structured. You can choose to generate either constants or formulas with the consolidation; if you go for formulas, the consolidation worksheet is automatically outlined so that you can switch from forest view to tree view with just a few mouse clicks.

OUTSTANDING CHARTING AND PUBLISHING

Excel's charting repertoire now includes three-dimensional bars, areas, lines, and pies. Unlike *1-2-3 for Windows*, the *Excel* 3-D types can be turned any which way so



Microsoft Excel, Version 3.0

Microsoft Corp., One Microsoft Way, Redmond, WA 98052; 206-882-8080.

List Price: \$495.

Requires: 2MB RAM, Microsoft Windows 3.0 or later, DOS 3.0 or later. Mouse recommended.

In Short: *Microsoft Excel*, Version 3.0, offers the most comprehensive set of analytical and presentation spreadsheet features available today and takes real advantage of the *Microsoft Windows* environment. Its one significant weakness is its inability to convert *Lotus 1-2-3* macros effectively.

CIRCLE 405 ON READER SERVICE CARD

One, Two, FREE!



Buy one of these Borland products...

Choose two of these free.

Right now, until January 31, 1992, if you buy Borland's Quattro® Pro 3.0® or Paradox® 3.5®, you'll get *two more great products* absolutely free! (Up to \$229 retail value!) Choose any two of the following products:

Borland's Sidekick® 2.0 (\$99⁹⁵), the world's best PC organizer; Quarterdeck's QEMM-386™ v6 (\$99⁹⁵), the best-selling memory manager; or Central Point Software's Central Point Backup™ 7.1 for Windows™ and DOS (\$129), winner of PC World's World-Class Award.

Buy Quattro Pro, the winner of 40 awards of excellence. With over one million users, it has all the features you're looking for in a high-end spreadsheet: powerful number crunching with advanced linking and consolidation, a fully integrated WYSIWYG display and Print-To-Fit™ that proportionally reduces your spreadsheet to fit on a single page.

Or buy Paradox 3.5, the #1 rated relational database. It's the best way to manage your important information.

It has powerful Query-by-Example, flexible multi-table and multi-record forms and built-in presentation-quality graphics.

Plus, when you buy either Quattro Pro 3.0 or Paradox 3.5, you'll qualify for Borland's Passport program: your Quattro Pro 3.0 purchase entitles you to your next Quattro Pro



upgrade for DOS or Windows for \$49⁹⁵; your Paradox 3.5 purchase entitles you to your next Paradox upgrade for DOS or Windows for \$139⁹⁵. These special upgrade prices are good until March 31, 1992.

So don't wait! *One, two, FREE, GO* to your nearest Borland dealer.

One, Two, FREE!

Buy Quattro Pro 3.0® or Paradox 3.5® between November 1, 1991 and January 31, 1992, and Borland will send you your choice of any two of the following products absolutely FREE: Borland's Sidekick 2.0, Quarterdeck's QEMM-386 v6, or Central Point Software's Central Point Backup 7.1

Check disk size required: ☐ 5¼" ☐ 3½"

Name

Company Dept/Mail Stop

Address

City/State/Zip Code

Country Telephone FAX

Borland product purchased Serial #

Free products desired (choose any two):

☐ Borland Sidekick 2.0

☐ Quarterdeck QEMM-386 v6

☐ Central Point Software Central Point Backup 7.1

Which publication do you read to make product purchase decisions?

Offer good in U.S. and Canada only. All coupons must be postmarked by February 28, 1992. Only original coupons will be accepted. No responsibility is assumed for lost, late, misdirected or destroyed mail. Please allow 2-4 weeks for delivery. Subject to all local, state and federal regulations. Void where prohibited.

*Offer not valid for Upgrades, Competitive Upgrades, LAN Packs, Multi-Packs, Volume Packs, Borland Scholar Program Products, or any other Borland promotion except Passport. Distributors and resellers not eligible to participate.

Q3C-PC Mag 12/91

BORLAND

Software Craftsmanship

CODE: MN01

All prices quoted are suggested retail price. All Borland products are trademarks or registered trademarks of Borland International, Inc. Borland is a registered trademark of Borland International, Inc. Copyright © 1991 Borland International, Inc. All rights reserved. Other company product names may be trademarks or registered trademarks of their respective companies. BI 1448

CIRCLE 285 ON READER SERVICE CARD

SOFTWARE SPREADSHEETS

that you don't have to rearrange your worksheet to make all the data points visible. Graphs can be created, printed, and saved in separate files or embedded on a worksheet. Usually, creating a graph is a matter of selecting a data range and pressing F11; to customize it, you double-click on a chart element (axis, data or point, or legend, for example) and fill out a dialog box. The complexity behind these services has been deftly concealed in Version 3.0 by a system of tunneling dialogs and drop-down gallery-style list boxes.

Publishing features are all built into *Excel*. You can use up to 256 fonts per worksheet, chosen from all fonts known to your *Windows* system. Boldface, italics, and underlining can be chosen from an icon bar. Custom numeric formats can be created, allowing you to do such things as assign scaling factors to numbers, assign colors based on values, align currency symbols regardless of number size, use multiple currency symbols on a given worksheet, turn zeros or negatives into text messages, and so on. A stylesheet system lets you assign a descriptive name to any combination of visual attributes—including font, numeric format, shading, color, alignment, and bordering.

Graphics images, charts, freehand drawing, and text objects (floating annotations or multicolumn headers, for example) can be embedded anywhere on a worksheet, not just on cell boundaries. An interactive print previewer takes most of the mystery out of printing and also lets you change column widths and margins without returning to the sheet.

THE LOTUS MACRO HURDLE

Excel's major remaining liability is that it still does an inadequate job of converting Lotus macros. *Excel*'s macro language is rich and extensible. You can create your own menu system and dialog boxes, for example, and tap *Windows* DLLs for lower-level functionality. But anyone with a deep investment in 1-2-3 applications will find conversion to *Excel* an exhaustively time-consuming task.

Breaking the 1-2-3 macro barrier remains a serious challenge for Microsoft—though not the only one. The arrival of *Lotus 1-2-3 for Windows* and the imminent arrival of a *Windows* spreadsheet from Borland means that *Excel* can't rest on its laurels. The competition is good news for users. *Microsoft Excel* is a great spreadsheet that's likely to get even better in 1992.

PlanPerfect

by Bruce Brown

WordPerfect Corp. is best known for its namesake word processing program, and you might expect its other application programs to be weak siblings not good enough to stand on their own. In the case of the company's \$395 *PlanPerfect*, Version 5.1, however, that expectation would be unfounded.

PlanPerfect is a text-mode spreadsheet that, while not uniformly strong in all areas, is a contender among DOS spreadsheets, and Version 5.1 is a good improvement over its predecessors.

One of the program's strong points is its command flexibility. You have your choice of interfaces with *PlanPerfect*. There's a bottom-of-the-screen, horizontal menu with first-letter activation, cursor highlighting, or mouse pointing. Or you can choose a top-line menu system with pull-down menus. Or you can use the function-key combinations used widely in *WordPerfect*.

If you have previous experience using either *WordPerfect* or *Lotus 1-2-3*, most basic-operation keystroke commands still work, easing transition to this product by flattening the learning curve. *PlanPerfect* 5.1 also reads and writes *Lotus* 1-2-3 .WKS and .WK1 files and will run 1-2-3 macros through 1-2-3, Release 2.01.

Two worksheet files can be held in memory at one time, and files can be linked to other files on-disk or in memory, but multipage or 3-D spreadsheets are not



possible. You can customize colors, but everything is done in text mode, with worksheets and graphics not displayed on the screen at the same time. You can bring both worksheets and graphics from *PlanPerfect* 5.1 into *WordPerfect*, however, and that's the answer if you want high-level spreadsheet and graphics publishing results from *PlanPerfect* worksheets.

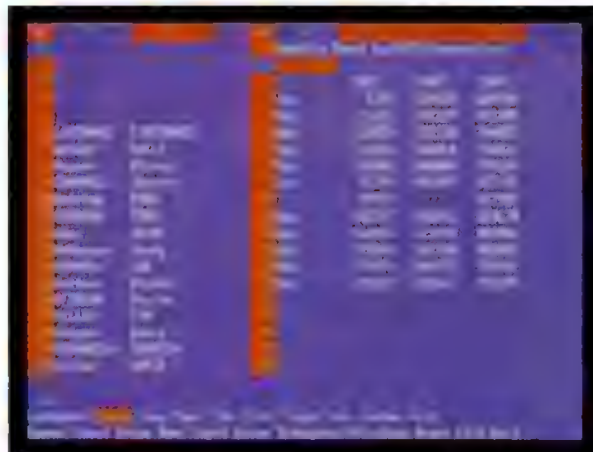
AUDITING NEEDS IMPROVEMENT

PlanPerfect's computation and analysis features compare well with other programs. Decimals are accurate to 15 places and while writing formulas you can select functions including syntax cues directly from a menu. There's not a lot of help with formula debugging, and spreadsheet auditing is also a weak area, lacking cell note attachments and dependency highlighting or mapping. Multiple circular references are tracked well, which for many

people is the sole important auditing feature.

Data manipulation and analysis are both adequate but not outstanding. *PlanPerfect* creates what-if tables and does matrix math, regression, and distribution analyses but lacks goalseeking and back-solver functions.

Sorting can be performed bidirectionally with up to 10 keys, but there is no case sensitivity. Complex data queries are allowed, but you can't use wildcards or perform updates or replaces during



You can open two worksheets at the same time in *PlanPerfect* and have the ability to view both worksheets with user-sizable text-mode windows.

The Real Surprise
Isn't That We
Fit VGA,
32,768 Colors,
Menu-Driven Set-Up,
Integrated IDE,
32MB of RAM
and 128K Cache
Into Our Smallest
Footprint Ever.



It's That We Als

TEMPO

INTRODUCING THE TEMPO C SERIES.

Evidently, one size does fit all.

That's the idea behind the new family of Tempo™ compact PCs from Everex™. Because, simply stated, we don't think less of a footprint should translate into less of a computer.

That's why we've created seven complete systems big enough to fit all the features you need. Best of all, we've made them available at prices sure to fit any budget.

But just because we've made them affordable, doesn't mean we've left anything out.

For example, these new Tempos are the only compacts with a VGA graphics adapter actually integrated onto the system board for true "High Color" capabilities. So, in addition to the highest video resolution available, you'll have 32,768 brilliant colors to take full advantage of all your Windows, OS/2 and UNIX applications.

And because today's advanced programs demand more power than ever, the Tempo compact, low profile computers deliver greater performance

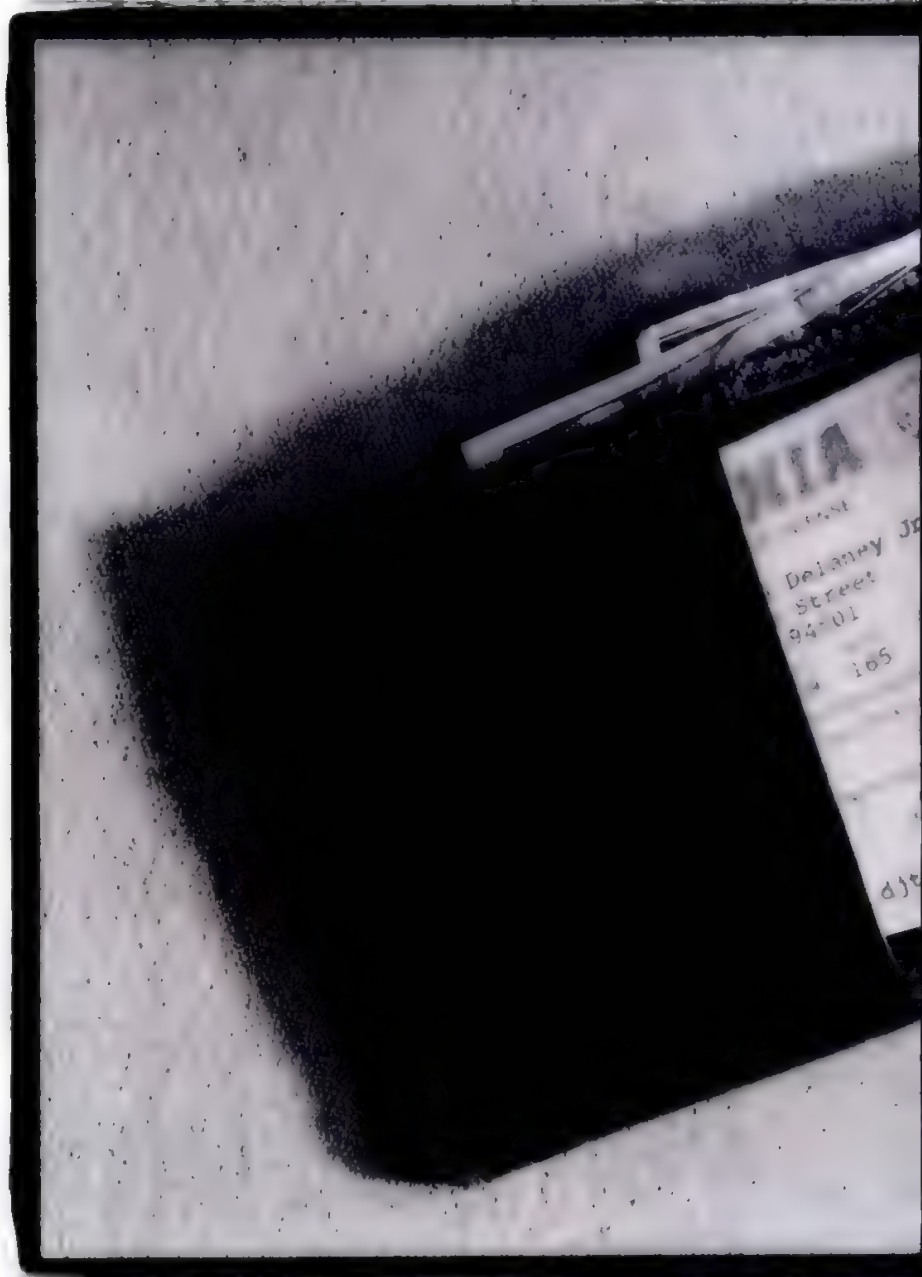


FREE WITH YOUR PURCHASE:

MS-Windows® 3.0	\$145 Value
MS-DOS 5.0	\$130 Value
MS-compatible Mouse	\$79 Value
Panacea Display List Driver for AutoCAD Release 11	\$99 Value

Total Value of \$453

Three month on-site service warranty and one year parts & labor warranty. (Warranties extendable to three years.)



Tempo 386SX/16c \$1,199

- Intel 80386SX 16MHz CPU
- 1MB RAM (up to 8MB)
- 128K Fixed Cache
- VGA Graphics
- 256K Video
- Choice of 1.2MB 5.25" or 1.44MB 3.5" Floppy Drive
- Supports i387 Math Coprocessor



Tempo 386SX/20c \$1,299

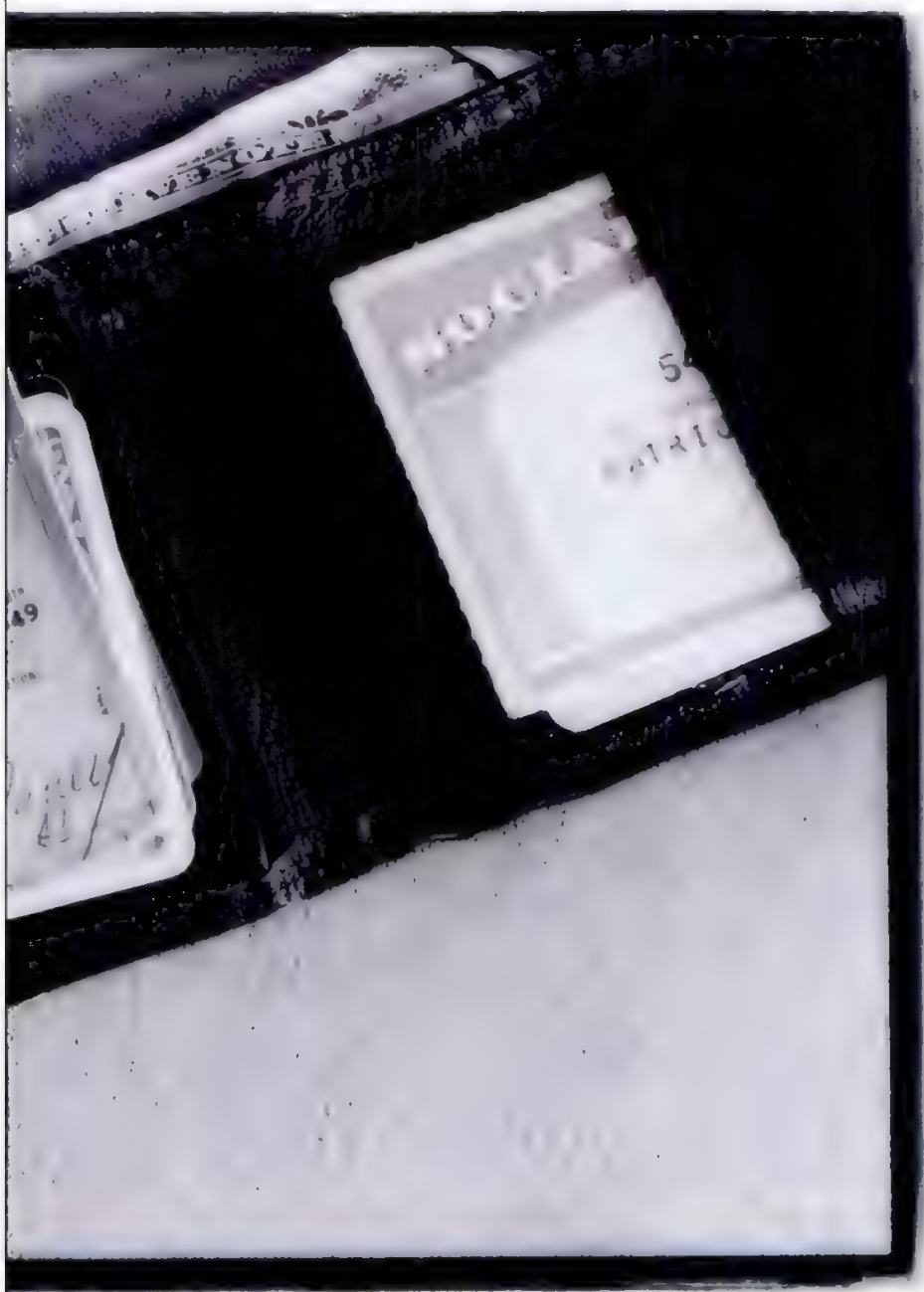
- Intel 80386 20MHz CPU
- 1MB RAM (up to 8MB)
- 128K Fixed Cache
- VGA Graphics
- 256K Video
- Choice of 1.2MB 5.25" or 1.44MB 3.5" Floppy Drive
- Supports i387 Math Coprocessor



Tempo 386/25c \$1,899

- Intel 80386 25MHz CPU
- 1MB RAM (up to 32MB)
- 128K Fixed Cache
- High Color VGA Graphics
- 512K Video (up to 1MB)
- Choice of 1.2MB 5.25" or 1.44MB 3.5" Floppy Drive
- Supports i387 Math Coprocessor

o Fit It In Here.



than many "full size" PCs.

You'll get up to 32MB of RAM and a cache size of 128K — twice that of other compact PCs — for maximum productivity in multi-tasking environments and memory-intensive applications. And, not only can you configure your own system with hard drives ranging from 80MB to 213MB, you can also upgrade at the lowest cost possible.*

All of which makes it very easy to choose any one of these new Tempo compact computers.

Once you do, you'll see that we've even made it easy to set them up. In fact, they're the only compacts to offer the simplicity of a menu-driven set-up program, rather than the inconvenience of individual diskettes. You'll even receive a one-year parts and labor warranty and three-month on-site service absolutely free.

So call us for more information about the new Tempo C Series. And discover the best fit in compact PCs.

ENTRE
COMPUTER CENTER™

LCBC
TODAY'S COMPUTER BUSINESS CENTER™

Connecting Point **III**
COMPUTER CENTERS

CompuCom
Systems

Intelligent
Electronics

FOR ADDITIONAL INFORMATION

or the reseller nearest you, call:

1-800-437-EVER

In Canada (1-800-663-5161)

Outside North America (510-498-1111).

EVEREX
EVER for EXcellence™



Tempo 386 33c \$2,699

- Intel 80386 33MHz CPU
- 4MB RAM (up to 32MB)
- 128K Fixed Cache
- High Color VGA Graphics
- 512K Video (up to 1MB)
- Choice of 1.2MB 5.25" or 1.44MB 3.5" Floppy Drive
- Supports i387 Math Coprocessor



Tempo 486SX 20c \$2,799

- Intel 80486SX 20MHz CPU
- 4MB RAM (up to 32MB)
- 128K Fixed Cache
- High Color VGA Graphics
- 512K Video (up to 1MB)
- Choice of 1.2MB 5.25" or 1.44MB 3.5" Floppy Drive
- Supports i487SX Math Coprocessor



Tempo 486 33c \$3,999

- Intel™ 80486 33MHz CPU
- 4MB RAM (up to 32MB)
- 128K Fixed Cache
- High Color VGA Graphics
- 512K Video (up to 1MB)
- Choice of 1.2MB 5.25" or 1.44MB 3.5" Floppy Drive
- Supports i487 Math Coprocessor

When you buy a new Windows™ system package from ZEOS® you really get a bundle.

Lotus 1-2-3® for Windows
Lotus Ami Pro® 2.0
Microsoft Windows 3.0
Microsoft DOS
Microsoft Mouse

ZEOS.

There's no reason to buy anything else.

800-423-5891

This offer is good for a limited time only. A ZEOS Windows system is any new ZEOS computer system packaged with Windows, 2MB DRAM or more and a mouse. Lotus, 1-2-3 and Ami Pro are trademarks of Lotus Development Corporation, Microsoft and Windows of Microsoft Corporation. All prices and specifications are subject to change without notice, call for current information. ZEOS is a publicly traded company NASDAQ/NMS Symbol: ZEOS © ZEOS International, Ltd., 530 5th Avenue NW, St. Paul, MN 55112.

VIEW YOUR DATA FROM EVERY ANGLE WITH PROCALC 3D

by Bruce Brown

If analyzing spreadsheet data is your primary need, you should consider the talents of Parsons Technology's *ProCalc 3D*, Version 1.01. This \$89 spreadsheet is limited to 512 rows, but its worksheets can also have 512 columns and be 512 pages deep. By turning and twisting this three-dimensional cube of data you can quickly see data results and relationships that would take longer to accomplish via traditional 3-D spreadsheets.

ProCalc 3D is a text-mode spreadsheet with top-line menus that cascade downward as you move among the levels. The menu command hierarchy is somewhat similar to that of *Lotus 1-2-3 for DOS*, Release 2.01, but the addition of separate top-line menu items for Cell, Block, Slice, and WorkCube immediately indicate that you're not dealing with a *Lotus 1-2-3* clone.

Once a workcube is set up, with separate pages for the budget of each of several departments, for example, you can quickly analyze data far beyond simple consolidations as long as all pages use identical layouts. Through the Workcube View menu you can look at the 3-D workspace from the top, bottom, left, right, front, and back.

PRACTICE PAYS OFF

Working with WorkCube effectively takes some practice, both to grasp the concepts and to manipulate the cube, but the payoff is in the relationships you start to see. For instance, with a 3-D set of budget sheets you can switch among views of monthly expenditures for a single account over multiple years, views of monthly totals for all accounts for all years, or views of account totals per division by year. In addition to looking at the outside of a cube, you can select a slice of the cube to

analyze data in a cross section.

ProCalc 3D's other functions, formulas, database management facilities, graphics, macros, and spreadsheet and worksheet publishing features are adequate but not outstanding. They are also largely similar to those features found in FormalSoft's *InstaCalc* (FormalSoft was *ProCalc 3D*'s previous publisher), although you cannot run *ProCalc 3D* in TSR mode. It uses expanded memory, if it is available, for storing data.

ProCalc 3D is best used in settings where close analysis of multiple variables is particularly important. Many traditional business applications don't require the ability to slice data in every way possible; scientific or research applications in which discovering and analyzing relationships between data types are more important are perfectly fit for *ProCalc 3D*. At \$89, *ProCalc 3D* can be a valuable tool. ■

ProCalc 3D

Parsons Technology Inc., One Parsons Dr., P.O. Box 100, Hiawatha, IA 52233; 800-223-6925, 319-395-9626.

List Price: \$89.

Requires: 512K RAM, DOS 2.11 or later.

CIRCLE 398 ON READER SERVICE CARD



ProCalc 3D uses a three-dimensional spreadsheet model that lets you rotate slices in a spreadsheet to create fresh perspectives on data.



PlanPerfect, Version 5.1

WordPerfect Corp., 1555 N. Technology Way, Orem, UT 84057; 800-321-5906, 801-225-5000.

List Price: \$395.

Requires: 512K RAM, DOS 2.0 or later.

In Short: *PlanPerfect*, Version 5.1, is a fine, text-based spreadsheet with particularly good charting, worksheet publishing, and applications development features. Unless you already are a *WordPerfect* user who has no need for a more powerful spreadsheet, there is no compelling reason to buy this product.

CIRCLE 406 ON READER SERVICE CARD

searches. File linking is possible with files either in memory or on-disk.

PlanPerfect creates attractive charts of many types and offers chart-enhancing options, including limited movement of chart objects while editing charts. There is limited chart automation; you have to type labels in specified locations for them to be used as you want them.

Spreadsheet publishing is fairly strong, especially for a text-based program, though it doesn't allow footnotes or multiple line headers or footers. There is a page preview mode, and multiple fonts are included with the program for use in spreadsheets and in charts.

BEST FOR WORDPERFECT USERS

PlanPerfect can import and export .WKS, .WK1, .DIF, and space-delimited ASCII files. The best interoperability features in *PlanPerfect* are limited to *WordPerfect* fans. You can use both programs, and *DrawPerfect* as well, under the included *WordPerfect Shell* program to get substantial file and data sharing and interaction.

Creating *PlanPerfect* macros is made easier with a macro editor and a feature that lets you choose macro commands directly from a menu that has the proper syntax. You can create menu-driven applications and use auto-load or event-driven macros that will execute when a

particular condition has been met.

PlanPerfect's performance times were not outstanding. Generating the "what-if" table in PC Labs' testing was very slow with two variables, but the time was significantly improved with a math coprocessor installed.

PlanPerfect 5.1 is a product to consider seriously if you're already a *WordPerfect* user and you don't need compatibility with or the functions of the newest versions of *Lotus 1-2-3*, *Excel*, or *Quattro Pro*. It combines good performance in most functional areas with impressive interoperability with other products from the same vendor. The bottom line remains that to get the greatest benefit from *PlanPerfect* you should be a *WordPerfect* user.

Quattro Pro

by Craig Stinson

Borland International's *Quattro Pro*, Version 3.01, is the try-harder champ of the DOS spreadsheet world. From its first days as an enhanced amalgam of the original *Quattro* and the short-lived *Surpass*, *Quattro Pro* has pursued three design goals: to provide a superset of *1-2-3* Release 2.0's capabilities, to run smoothly on all hardware from 512K 8088s on up, and to exploit weaknesses in the Lotus lineup. The strategy has enabled Borland to become a persistent burr in the market-leader's heel—and to earn an Editors' Choice in our April 24, 1990, review of spreadsheets.

Quattro Pro 3.01—a minor cleanup of the release that shipped last spring—does everything that *Lotus 1-2-3* Release 2.3 does, and a great deal more.

It has several weaknesses relative to its archrival. It's slower in some areas (file load, program startup, recalc of financial functions), and it lacks auditing features. More significantly, it can't take advantage of *1-2-3*'s aftermarket. An add-in API was intended to be part of the original *Quattro* but was canceled.

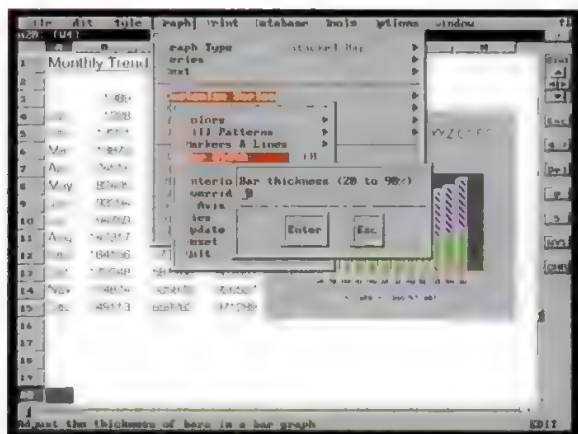
On the other hand, it has many features not found in *1-2-3* Release 2.3. *Quattro Pro* works with multiple files (up to 32) in memory, offers more sophisticated file-linking capability than *1-2-3* Release 2.3, has a superior set of graphing features (including a slide-show utility), and provides a richer application-development environment.

Quattro Pro features a "soft" user interface. Users can switch among three supplied menu trees, one of which provides complete keystroke and macro compatibility with *1-2-3* Release 2.2. The program can also be set to record macros that will export successfully to *1-2-3* spreadsheets.

(Six Lotus macro verbs added to *1-2-3* in Release 2.3 will not play in *Quattro Pro*. These are {Appendbelow}, {Appendright}, {Form}, {Formbreak}, {Frameoff}, and {Frameon}). Also, macros tailored for the Lotus Macro Manager may need adjustment to work properly.)

VERSATILE CHARTS AND PUBLISHING

Along with the customary business chart types, *Quattro Pro* offers three-dimensional bars, lines, areas, and pies, plus "text" graphs. A text graph is simply a blank slate on which to create headings, bullet lists, and other written information. Graphs can include two y-axes for clarity, and logarithmic scaling is available.



Quattro Pro offers a rich assortment of graph-customizing options and can print and display graphs alongside worksheet data.

With the program's Annotator module, you can dress up any chart with arrows, lines, shapes, and CGM-format clip art. (A bundled ProView Powerpak provides sample clip-art images, along with handy macros and aesthetic tips.) By creating a simple worksheet table, you can turn a set of named graphs into a slide show, complete with transitional effects and on-demand branching. Application developers can also use the graphics features to create appealing custom menu systems. *Quattro Pro*'s charts are not as customizable or easy to create as those of *Excel*, but they're as close as anyone has come in a non-Windows program.

Quattro Pro's publishing features, unlike those of *1-2-3*, are integrated into the core of the program, so you can work with them in either character mode or a graphics-based WYSIWYG mode. Like its competition, *Quattro Pro* lets you use up to eight fonts on a worksheet, chosen from a supply of Bitstream Courier, Swiss, and Dutch outlines. (Unlike the Lotus WYSIWYG add-in, however, *Quattro Pro* treats each style variant of a given typeface as a single font. So if your worksheet uses Swiss, Swiss Bold, Swiss Italic, and Swiss Bold Italic, you've exhausted half your allotment of eight.)

For display typography, you can also choose from a set of attractive Hershey-font bitmaps. A variety of bordering and shading options are available, and the print menu includes a couple of handy scaling and page-fitting options. Those with dot matrix printers can also take advantage of a banner printing feature, which outputs wide worksheets across the



Quattro Pro, Version 3.01

Borland International Inc., 1800 Green Hills Rd., Scotts Valley, CA 95067; 800-331-0877, 408-438-8400.

List Price: \$495.

Requires: 512K RAM, DOS 3.3 or later.

In Short: *Quattro Pro*, 3.01's assets include *Lotus 1-2-3* compatibility, the ability to work with multiple files in memory, a strong battery of charting and publishing options, the ability to run on entry-level hardware, and a rich applications development environment. Its only major weakness is that it can't use *1-2-3* add-ins.

CIRCLE 407 ON READER SERVICE CARD

PRICE: The New PC Revolution!



More Radical

CompuAdd Presents New, Improved Designs



Reductions!

and Our Lowest Prices Ever!

The new PC revolution is all about price. At CompuAdd, we know that competitive prices and good values are the most important things we offer. We also know that the people who buy PCs find our competitors' high prices on new technology revolting! That's why at CompuAdd, we've dropped our prices on our most popular systems and introduced unbeatable low prices on our new improved designs, too.

CompuAdd has always led the way among PC compatibles when it comes to customer satisfaction and outstanding service. Now CompuAdd leads the way in pricing too! The people who buy PCs have toppled the old systems and turned to the marketplace for alternatives. CompuAdd is ready with new technology at revolutionary prices.

"Price-conscious PC buyers have turned to clones, and few regret the choice."

-PC World August 1991

CompuAdd[®]

Customer driven, by design.

Call 800-456-3660

Design Evolution,

The New, Low Profile Chassis at



CompuAdd 316s

Reduced \$100

\$1295

CompuAdd 320sc

Reduced \$100

\$1695

CompuAdd 325

NEW!

\$1795

CompuAdd 333

NEW!

\$2295

Price Revolution!

the New, Low Profile Price!

Now get 386SX performance at the lowest possible price! Perfect for the small business, as a network station or as your home computing center — an all-round workhorse when it comes to Windows applications! Pick up the 316s loaded with Windows 3.0, now at an all-time low price!

Monitor and Hard Drive Options

	40MB	80MB
316s		
MGA	\$1295	\$1495
High-Resolution VGA	\$1595	\$1795

The most expandable 386 20MHz system you can buy! The 320sc's unique motherboard holds 32KB built-in cache memory to speed up data access, while the Hi-Res VGA controller, also built in to the motherboard, delivers incomparable video!

Monitor and Hard Drive Options

	40MB	80MB
320sc		
MGA	\$1695	\$1895
High-Resolution VGA	\$1995	\$2195

CompuAdd's newest stretch chassis, low profile system features the hottest innovation on the market: local video. Avoid the system bottlenecks of the AT-bus and achieve wait states-to-video memory equivalent to DRAM memory!

Monitor and Hard Drive Options

	40MB	80MB
325		
MGA	\$1795	\$1995
High-Resolution VGA	\$2095	\$2295

We've built the video on the local bus and stretched the chassis to two accessible 5.25" and two 3.5" internal bays, so you get the greatest expandability and flexibility available in a low profile system. The CompuAdd 333 also offers 128KB built-in cache memory — twice the industry norm!

Monitor and Hard Drive Options

	80MB	120MB
333		
MGA	\$2295	\$2395
High-Resolution VGA	\$2595	\$2695

Our new stretch chassis gives you expandability in a low profile, small footprint design! It's roomy enough for two internal 3.5" hard drives plus two accessible 5.25" drive bays — allowing you an extra 5.25" floppy drive, CD ROM or a tape backup.

CompuAdd®
Customer driven, by design.

Call 800-456-3660

Low Prices Give

Power Users' Favorites, Now at



CompuAdd 325

Reduced \$250

\$1995

CompuAdd 333

Reduced \$300

\$2695

CompuAdd 433E

Reduced \$620

\$3995

People Power!

Substantial Reductions!

A true 32-bit 386 machine designed for power users. As a small business file server, a low-cost CAD machine or a multitasking workstation, it's unsurpassed. Built-in cache memory controller and hard drive options up to 200MB are available.

Monitor and Hard Drive Options

	40MB	80MB
325		
MGA	\$1995	\$2195
High-Resolution VGA	\$2295	\$2495

PC Magazine chose the 333 as a finalist in its Technical Excellence Awards. Two 16-bit expansion "hot slots" are provided for the HardCache/ESDI controller and Hi-Rez VGA graphics card. Plug them in for spectacular data transfer and video performance! The optional 640KB SRAM card puts DOS and DOS-based applications into true 0 wait-state memory.

Monitor and Hard Drive Options

	80MB	120MB
333		
MGA	\$2695	\$2795
High-Resolution VGA	\$2995	\$3095

The expanded 32-bit EISA bus lets you access any memory or peripheral device installed on the system — regardless of bus width! Use your old 16-bit peripheral cards alongside new 32-bit EISA cards with no compatibility problems. A "hot slot" for the Hi-REZ VGA controller and a specially designed optional cache module move your data through at lightning speed.

Monitor and Hard Drive Options

	80MB	120MB
433E		
MGA	\$3995	\$4095
High-Resolution VGA	\$4295	\$4395

These high-performance, low-cost desktop systems are designed to take on your toughest computing challenges. They pack enough power and punch to serve as CAD/CAM stations or network files servers. Now they're available at amazingly affordable prices that put vast computing power within everyone's reach.

CompuAdd®
Customer driven, by design.™

Call 800-456-3660

Less is More.

Less than 7 Pounds and Less than \$2000.



Our 316nx just got \$500 lighter! The CompuAdd 316nx doesn't sacrifice on performance either. It uses the Intel 16MHz 386SX microprocessor with a big 30MB standard hard drive and a 3.5" 1.44MB diskette drive.

When Your Desktop is an Airline Tray Table...

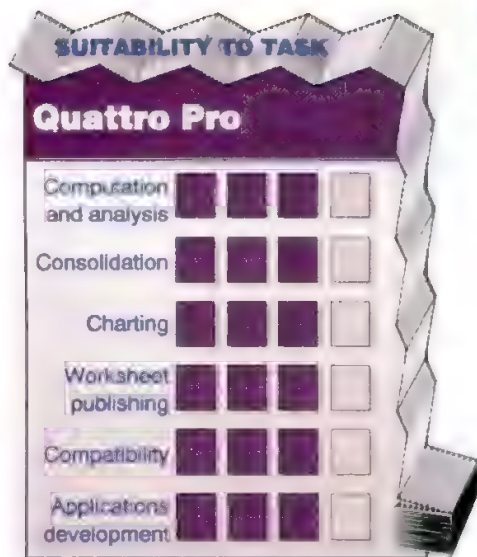
You'll appreciate the large well-spaced keys and backlit, monochrome VGA liquid crystal display. Hard to believe we got it all into an 11" x 8.5" x 2.1" notebook package, isn't it?

CompuAdd®
Customer driven, by design.

Call 800-456-3660

Hours: Monday-Friday 7:00am to 9:00pm CST; Saturday 9:00am to 5:00pm CST
12303 Technology Blvd. Austin, Texas 78727

CompuAdd Corporation, 1991. We accept MasterCard, VISA, Discover, money orders, certified checks (please allow ten days for processing), CODs (\$50 minimum order), company and institutional purchase orders (minimum initial purchase \$500, thereafter \$50), and wire transfers. Prices do not include shipping and handling. Please add appropriate local sales tax. Opened software, videotapes, other consumables and shipping costs are nonrefundable. All return items must be accompanied by a returned merchandise authorization (RMA) number. Prices and product descriptions are subject to change without notice. CompuAdd is not liable for damage due to omissions or typographical errors.



fanfold in landscape mode.

In the original release of *Quattro Pro* 3.0, the WYSIWYG screen had a number of irritating tics that made it unsuitable for everyday spreadsheet work. These have been eliminated in Version 3.01. One remaining limitation of WYSIWYG mode is that it doesn't permit overlapping worksheets; you can tile and zoom, however.

DATABASE LINKS

Provided you have at least two megabytes of extended memory, you can use *Quattro Pro* as a front end for Borland's *Paradox* database. Simple keystroke combinations (and a new *Paradox* PAL statement) allow you to maintain context in both programs as you toggle from one to the other. With the separately sold *SQL Link*, you can also use *Quattro Pro* to tap SQL data residing on networks, minis, or mainframes.

Other pluses include a built-in DOS file-management utility, a backsolver and linear optimizer (the latter, unfortunately, nearly unusable unless you're schooled in linear algebra), a macro debugger complete with breakpoints and watch variables, and some very handy extensions to the Lotus-standard macro language and function repertoire. Developers will particularly appreciate the {stepon} and {stepoff} commands, the freedom to embed comments and blank rows into macro code, and the ability to get current menu settings via the @CURVALUE function.

For those who prefer the DOS environment and its less demanding hardware requirements, don't require access to 1-2-3 add-ins, and can live without audit-

SOFTWARE SPREADSHEETS

ing features, *Quattro Pro* is the most versatile spreadsheet you can buy.

Wingz

by Bruce Brown

Informix Software's *Wingz*, Version 1.1a, comes with complete versions for both *Microsoft Windows* 3.0 and OS/2 in the same \$499 package. This one-box, two-system approach shows Informix's commitment to multiple platforms. *Wingz* is most appropriate for use in organizations that need to use the same spreadsheet on a wide variety of machines. But its below-average number of functions and awkward menu structure won't do much to attract new users, nor will they convert 1-2-3, *Excel*, or *Quattro Pro* users.

At first glance, *Wingz* looks like a typical *Windows* program, and you'll have little difficulty using it for basic tasks if you already know spreadsheets. One helpful addition is a column of tools on the left side of the screen that are used to select objects, create macro command buttons, draw, and chart. In some cases where dialog boxes would be more helpful, *Wingz* makes you continually go back to reopen pull-down menus—for example, when defining parameters for graphs.

Wingz does not set up 3-D spreadsheets, but you can open multiple windows in which each holds a separate spreadsheet. Unfortunately, any linked file must be open in order for all the links to work.

THE KING OF INTEROPERABILITY

Wingz is available for many platforms and runs the same on all of them, with the same menus, the same features, and even interchangeable compiled program files via the included HyperScript programming language. You can use *Wingz* applications interchangeably on Unix systems, Macintoshes including System 7 machines, NeXT systems, and machines from Hewlett-Packard, Sun, Data General, IBM RISC, and Mips. No other spreadsheet program

on the market is as transportable as *Wingz*.

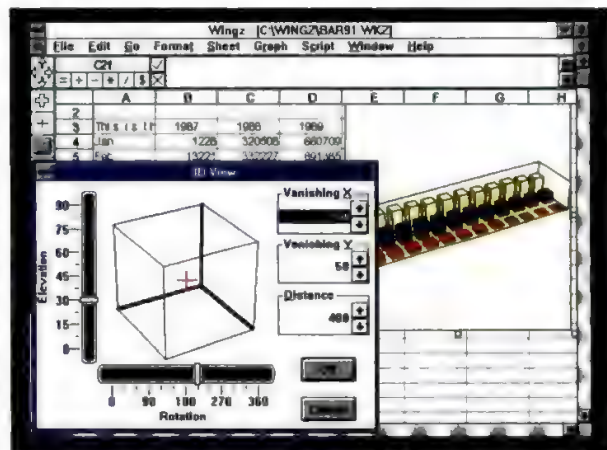
Formulas in *Wingz* can be as long as 1,023 characters and are supported by 147 functions in addition to the program's 173 programming functions. Decimal precision tested accurate to 13 places. Spreadsheet auditing is only moderately powerful; while the program will display many cell types and dependencies via a Select menu option, circular references aren't tracked well. Other than an on-screen note that appears when a formula containing a circular reference is first written or edited, there is no continual tracking or highlighting of this troublesome formula problem.

Wingz does matrix math and inversions. It performs regression, distribution, and what-if table analysis as well, but there is no solver or back-solver function, an obvious shortcoming that other *Windows* spreadsheets like *Excel* and *Lotus 1-2-3 for Windows* have addressed.

WEAK DATABASE TOOLS

Database operations are equally marred by a lack of advanced features. *Wingz* has good database query features but no search-and-replace during the query. The program supports bidirectional sorting with up to 256 sort keys but has no provision for case sensitivity. With the lack of 3-D spreadsheets and the requirement that linked files all be in memory, data consolidation features are limited.

Charting features abound, with many chart types and lots of options including 3-D rotation on x-, y-, and z-axes. Creating a chart is more cumbersome than it need be, however. It requires that you reopen the graphics menu while selecting options. Dialog boxes for modifying



Wingz, whose Macintosh heritage is readily apparent, gives you a great deal of control over chart objects. The Setup dialog box includes sliding scale controls for 3-D chart views.



Wingz, Version 1.1a

Informix Software Inc., 4100 Bohannon Dr., Menlo Park, CA 94025; 800-438-7627, 415-926-6300.

List Price: \$499.

Requires: 2MB RAM, Microsoft Windows 3.0, DOS 3.0 or later. Mouse recommended.

In Short: If you already live in a world of Informix applications or have other versions of *Wingz* running on other platforms, you'll love the interoperability of the OS/2 and Microsoft Windows versions of the program. *Wingz*, Version 1.1a, also shines in applications development, with a high-level programming language and compiler, but its impressive graphics capabilities are hindered by an awkward interface.

CIRCLE 406 ON READER SERVICE CARD

SOFTWARE SPREADSHEETS

charts would be a big improvement.

Wingz shines in its applications development features. The HyperScript programming language is used to create and edit screen macros, file macros, and command files that can be as trivial as a row insert key or as complex as a full application. Macro files are compiled to a format that runs on all *Wingz* platforms and can include hooks to external routines written in Pascal, C, or other high-level languages. Its differentiation from other spreadsheet macro languages is its depth and multiplatform features.

Wingz spreadsheet performance times were consistently among the fastest for the group evaluated here. The link refresh times were particularly fast since linked files must remain in memory. While the *Wingz* documentation recommends using a math coprocessor chip, no significant performance improvements were noticed when we tested that way.

If you already use *Wingz* on Macintosh, Unix, or mainframe systems and want to be able to share developed applications as well as data files with PC users,



the zero learning curve for the PC versions of *Wingz* makes sticking with *Wingz* the right idea. If you don't need a full application development language and don't use other *Wingz* versions, there's not enough here to attract you. ■

Bruce Brown and Craig Stinson are contributing editors of PC Magazine.

MOVING?

Please write to: PC Magazine, P.O. Box 54093, Boulder, CO 80322. Include your mailing label from a recent issue of PC Magazine for faster service. Please allow up to 60 days for change of address to take place.

Are you too wrapped up in your work?

≡ Today's business has a problem. It's overflowing filing cabinets. It's waiting for someone to type it into our systems. Or to find out where it's been filed. Quite literally, it's burying our best ideas alive. ● The problem is paper. Or, more precisely, how to cope with all the information that comes to us on paper. ■ We are pleased to report, however, that there is a solution. Calera's OCR (Optical Character Recognition) technology lets you convert any paper or electronic fax document to word processing, spreadsheet, desktop publishing or database applications (with Windows). Ready in moments for revisions, retrieval or networking and E-mail. { Among our powerful range of OCR systems and software: WordScan™ and WordScan Plus. The former, offering a broad set of features at a price anyone can afford. The latter, with productivity tools not found anywhere else. Which is why Calera consistently wins first place awards from *PC Magazine*, *PC Week*, *Infoworld*, *Byte Magazine* and others worldwide. ■ So call Calera today for information about our OCR productivity tools. And let us take the wraps off new ways to handle all that paperwork.



CALERA
RECOGNITION SYSTEMS

475 Potrero Ave., Sunnyvale, CA 94086 USA
(800) 544-7051 Outside USA (408) 720-0999 FAX (408) 720-1330

Call (800) 544-7051 For The Name Of The Dealer Nearest You And For A Free Full-Working Evaluation Copy Of WordScan Plus.*

© 1991 Calera Recognition Systems. Calera® is a registered trademark and WordScan™ is a trademark of Calera Recognition Systems, Inc. All other products and brands are the property of their respective trademark holders. *Offer valid in USA only.

CIRCLE 522 ON READER SERVICE CARD

Imagine getting twice the Bernoulli for two-thirds the price.

The new Bernoulli 90MB.



Welcome to
the next
generation of

removable storage, the new
Bernoulli® 90 from Iomega.*

At 90 megabytes per
removable disk, we've more
than doubled our capacity.
Yet the new Bernoulli 90 is
actually less expensive than
the Bernoulli 44. A lot less.
And with a new, 19-msec*
effective access time, a lot
faster, too.

The best part is, it's all
Bernoulli. Rugged, reliable,
endless storage. Just what
storage-intensive users—like
Windows users—demand.

More value.

If you need more storage,
you'll welcome the Bernoulli
90, since it's now comparable in price to
a hard disk upgrade. So why not buy a hard
disk? Consider what you *don't* get with a hard disk.

You don't get infinite storage in 90-megabyte
increments—hard disks fill up. You don't get 180MB of
easy backup. You don't get the physical security of

removable data disks, or head-
crash-resistant technology. You
don't get compatibility with all
major operating systems, and
workstations. And you don't
get Central Point's Backup
software.

In short, you don't get
a Bernoulli.

More recognition.

Leading publications have
given us welcome recognition,



Welcome to the 90s.

but
with a 98
percent satisfaction

rate, our biggest supporters are Bernoulli users.

Our users enjoy worldwide support and a 24-
hour** drive replacement service. To further protect
their investment, we've designed the Bernoulli 90 to
read 44MB disks. And we're instituting an upgrade
program to help get every Bernoulli user into the 90s.

Call 1-800-777-4073†

Questions? We don't blame you. There's a lot more you
should know about—like our free, 90MB disk offer,
drive configurations, Bernoulli Technology®, and speci-
fic pricing. So we've prepared a brochure that's yours
with a phone call. Find out
what a welcome change
Bernoulli can be. Before
the 90s leave you behind.

IOMEGA®
Makers of Bernoulli

CIRCLE 378 ON READER SERVICE CARD

Choosing And Using Hard Disks

Whether your hard disk is on its last legs or you are just running out of room, here is everything you need to know to buy your next drive: how hard disks work, how to make them work in your PC, and how you can find the best buy.

by Winn L. Rosch



In a world where the next exciting new technology hits before you have finished oohing and aahing at the last one, hard disk drives may seem mundane. But if your hard disk has failed or you want to add a bigger, faster drive to your system, all the latest changes and innovations in disk drive technology may surprise you. Your next hard disk is apt to be substantially different from your current drive. Of course it will be faster and have a greater capacity. But in all likelihood it will also

PERFORMANCE TIPS

■ Trim your search path

Although the tree-structured directory systems used by DOS versions since 2.0 are a great way to organize your hard disk, they can also slow down performance. To find the starting cluster of a file (which is where DOS must always start reading a file), DOS needs to read through each layer of subdirectories along the way. This research can involve a lot of head movement on your hard disk when a file is buried under several layers of subdirectories, though DOS will search the directories in your PATH statement first. If you want to take advantage of all the speed your hard disk has to offer, you will want to be sure that the files you use most often are near the top or the root directory.

Also, when you make a mistake, you will get your DOS prompt back faster if you trim the length of your search path. The fewer alternative paths you specify, the less time it will take DOS to zero in on the program you want (or give you the message that the program cannot be found). If you must specify more than one directory in a PATH command, put your most frequently used programs in the first directory specified.

DOS is able to find devices—including disk partitions that are given their own drive letters—faster than it can dig down into subdirectories. So you can speed access by organizing your files in partitions (using FDISK) rather than using subdirectories (using MKDIR). Note that using the SUBST command to give drive letter designations to subdirectories will not enhance disk speed, because although the process is invisible to you, DOS still must search through those subdirectories, despite their drive letter designations.

New drives, as you will see, have more advantages than just lower prices, higher capacities, and faster speed—as if those aren't reasons enough to upgrade. Newer drives are also more reliable, because they use newer technologies that generate less heat. The lessons to learn are: always back up, replace rather than repair, and upgrade rather than try to coax the last spark of life from any hard disk.

WHAT TO DO WHEN IT FAILS

Some hard disk failures are easy to repair. First, you should make sure that a dead

be physically tiny, be more reliable, use a new interface, and use technologies you may have never heard about before. And because of the economy and some shaking out in the industry, today's hard disk prices are the best ever.

Odds are that today's software is pushing your current drive to its limits. And although you may not really need more storage space, you may want it anyway. Even if your hard disk hasn't failed, you have probably started pining for a bigger drive. But buying a hard disk today involves more than just choosing a product: It means choosing a technology. This article explores all the latest trends in hard disks, comparing each of the technologies for you. We will start with some answers to basic questions, then take a close look at the latest technologies, and finish up with a glance at the marketplace. If you are unfamiliar with the terminology, see the glossary, which includes a diagram of a hard disk. For a quick comparison of the technologies, see the table "How the Interfaces Compare." And to get the most out of your drive, read the performance tips, scattered throughout the story.

LIFE CYCLE OF A HARD DISK

Hard disk drives often fail quite suddenly. You switch on your PC and instead of a C:\> prompt, you see an ominous error message, such as the often fatal numbers 1701. (In the IBM code scheme, error messages prefaced with 17 indicate a problem in your hard disk system.)

Unfortunately, you can no more predict the failure of your drive than you can predict the next political revolution, so prepare for the worst daily and back up. Symantec Corp.'s \$149 program *The Norton Backup* (800-441-7234) won Editors' Choice in our most recent comparison ("Premium Insurance: Backup Software Gets Better," *PC Magazine*, June 11, 1991).

While there is no foolproof way to gauge how long hard disks will last, manufacturers rate their products using a mean time between failure (MTBF) measurement. Statistically, the MTBF is the best estimation of how long your hard disk will run before it crashes. Your hard disk, however, will probably become obsolete long before it fails. Furthermore, warranties generally run out before the MTBF. For example, a drive with a claimed 50,000-hour MTBF typically carries a one-year warranty, which equals 8,760 continuous hours.

battery didn't make your system lose its setup memory and forget what kind of drive was installed. Then check your controller to ensure that it is properly seated in its socket and that all the cables between the controller and your drive are fully plugged in at both ends. Those quick experiments are all most people can do to repair an ailing drive. But for anything more serious, you'll need a soldering iron, the knowledge to use it, and a clean room. A clean room is an environmentally controlled chamber that filters out all airborne particles smaller than 10 microns. (A micron is one-millionth of a meter; the diameter of a human hair is roughly equivalent to 100 microns.)

You could send your old drive out for repair, but face it: You'll get back a piece of hardware that is no more reliable than it was before the failure—and probably less reliable, if the shop lacks a clean room. Considering that setting up a clean room costs more than a million dollars, you can bet that neither the corner computer repair shop nor the company with a tiny mail-order disk repair ad really has the proper facilities.

The only compelling time to repair a failed hard disk is when you have important files on it and you were negligent in your efforts to back up. Then contact a data recovery service, such as Advanced Computer Repair (805-484-3319), which charges \$275 to recover the missing data and between \$150 and \$200 (which does not include shipping) to repair a 40MB drive, or Ontrack Data Recovery (800-872-2599), which charges customers approximately \$200 to diagnose the disk's ailment (within 24 hours) and an additional \$200 to \$600 (not including shipping) to restore the data on a 40MB drive. You can usually get your files back, but you won't want to depend on your drive thereafter.

Your drive may give you a few hints at impending problems. For example, if you start getting an increasing number of disk errors, you can be sure that something is deteriorating in your drive. Commercial disk-testing software can help locate and even minimize the effect of these errors on your files: *Disk Technician Gold*, \$149.95, from Prime Solutions (800-847-5000); *SpinRite*, \$89, from Gibson Research Corp. (800-736-0637); *Mace Utilities*, \$149, from Fifth Generation Systems (800-777-5306); *The Norton Utilities*, \$179, from Symantec Corp. (800-441-

GLOSSARY

■ **areal density** The amount of data that can be stored in one area of a disk.

■ **average access time** The time (in milliseconds) that the drive takes to find the right track in response to a request (the seek time), plus the time it takes to get to the right place on the track (the latency). IBM PC-XTs used 80- to 110-millisecond drives, while ATs used 28- to 40-ms. drives, and today's 80386- and 80486-based systems use 15- to 20-ms. drives. A computer's score on PC Magazine Labs' BIOS Disk Seek test is a measure of the average access time.

■ **buffer** An area of RAM (usually 512 bytes plus another 16 for overhead) in which DOS stores data temporarily.

■ **cluster** A group of sectors; the smallest storage unit recognized by DOS. On most modern hard disks, four 512-byte sectors make up a cluster, and one or more clusters make up a track.

■ **cylinder** A three-dimensional stack of vertical tracks from multiple platters. A drive's number of cylinders corresponds to the number of different positions to which the read/write heads can be moved.

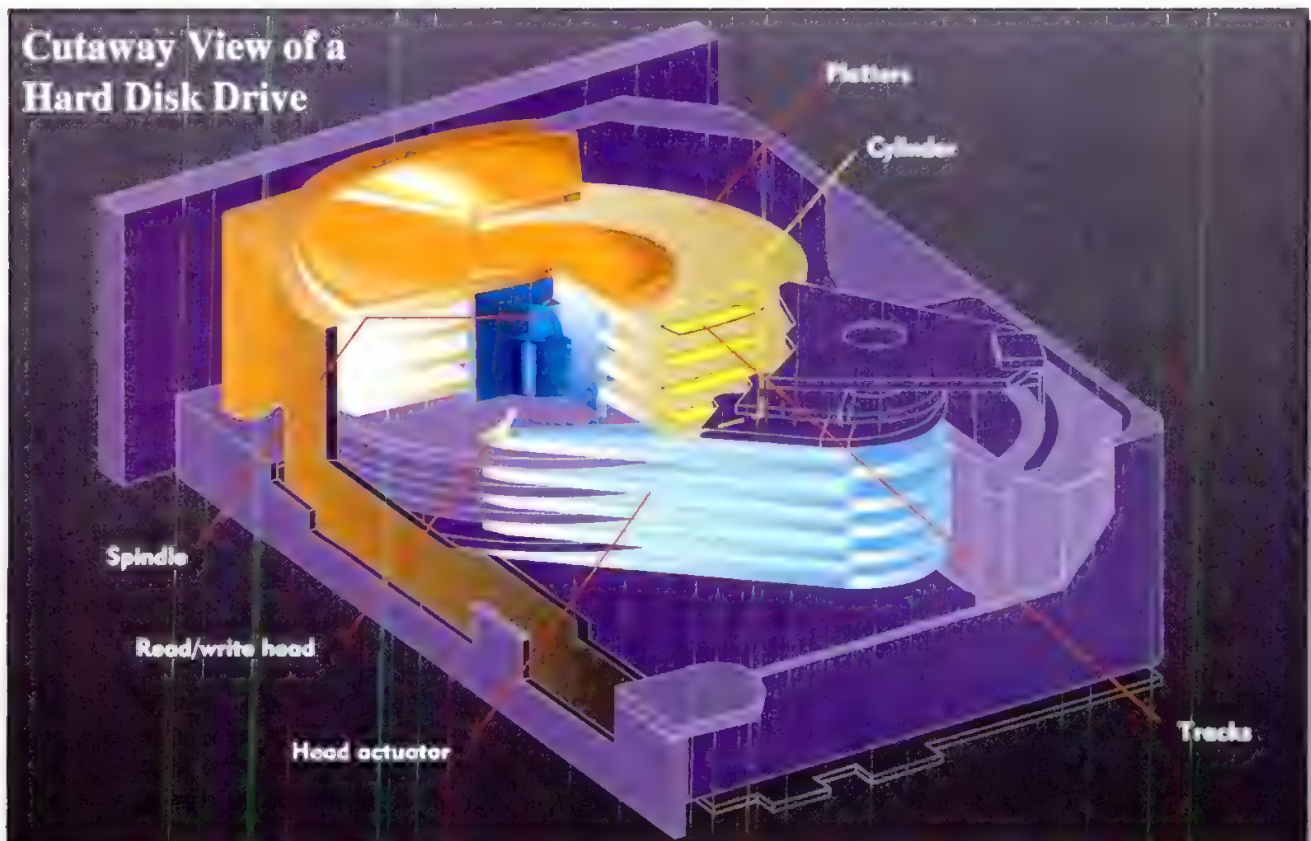
■ **device-level interface** An interface that uses an external controller to connect drives to the PC. Among its other functions, the controller converts the serial stream of data read from the drive into parallel data for the host computer's bus. ST506 and ESDI are device-level interfaces.

■ **drive array** A storage system composed of several hard disks in which data is divided among the different drives for greater speed and higher reliability.

■ **ESDI (enhanced small device interface)** A device-level interface designed as a successor to ST506 but with a higher transfer rate (1.25MB to 2.5MB per second).

■ **GCR (group coded recording)** A storage process in which bits are packaged as groups, with each group assigned to and stored under a particular code; used by RLL drives.

■ **head actuator** The mechanism that moves the read/write head radially across the surface of the platters of a disk drive.



■ **IDE (integrated drive electronics)** A system-level interface that conforms to ANSI's AT Attachment standard, which uses a variation on the AT expansion bus to connect a disk drive to the CPU, with a maximum transfer rate of 4MB per second. Originally, IDE was a generic term for any system-level interface (one that integrates controller electronics onto the drive).

■ **interface** The connection between the disk drive mechanism and the system bus. The interface defines the way signals pass between the system bus and the hard disk, which in turn determines the speed at which information can be transferred between them. Examples are ESDI, IDE, SCSI, and ST506.

■ **interleaving** A method of arranging disk sectors to compensate for relatively slow computers. Instead of sectors being arranged consecutively, they are spread apart. For example, 3:1 interleaving means your system reads one out of every three tracks on one rotation. The time required for the extra spin lets the read/write head catch up with the disk drive, which might otherwise outpace the head's ability to read the data. Thanks to track buffering and the speed of today's PCs, interleaving is obsolete. Look for "1:1 interleaving" (which actually indicates a noninterleaved drive).

■ **MFM (modified frequency modulation)** A method of magnetically encoding information that creates a one-to-one correspondence between data bits and flux transitions (magnetic changes) on a disk. It uses smaller storage densities and lower transfer speeds than RLL.

■ **platter** The actual disk inside a hard disk drive; this is what carries the magnetic recording material. All but the

thinnest disk drives have multiple platters, most of which have two sides that can be used for data storage. (On multiple-platter drives, one side of each platter is usually reserved for storing control information.)

■ **read/write head** The part of the hard disk drive that writes data to or reads data from a platter. It functions like a coil of wire that reacts to a changing magnetic field by producing a minute current, which can be detected and amplified by the electronics of the disk drive.

■ **RLL (run length limited)** A method of encoding information magnetically that uses GCR to store blocks instead of single bits of data. It allows greater storage densities and higher transfer speeds than MFM.

■ **SCSI (small computer system interface)** A system-level interface, designed for general-purpose applications, that allows up to seven devices to be connected to a single host adapter. It uses an 8-bit parallel connection that produces a maximum transfer rate of 5MB per second. The term is pronounced "scuzzy."

■ **sector** The basic data storage unit on hard disks. On most modern hard disks, sectors are 512 bytes each, four sectors make up a cluster, and there are 17 to 34 sectors in a track—although newer drives may have different numbers of sectors.

■ **spindle** One part of a hard disk drive, around which the platters rotate.

■ **ST506** A device-level interface; the first interface used with PCs. It provides a maximum data-transfer rate of less than 1MB per second (625K per second

with MFM encoding, or 984K per second with RLL encoding).

■ **system-level interface** A connection between the hard disk and its host system that puts control and data-separation functions on the drive itself (and not on the external controller). SCSI and IDE are system-level interfaces.

■ **track** The circular path traced across the spinning surface of a disk platter by the read/write head. The track consists of one or more clusters.

■ **track buffer** Memory sometimes built into disk drive electronics, sufficient to store the contents of one full track. This allows the drive to read the entire track quickly, in one rotation, then slowly send the information to your CPU. It eliminates the need for interleaving and can speed up drive operation.

■ **transfer rate** The speed at which a disk drive can transfer information between its platters and your CPU. The transfer rate is typically measured in megabytes per second, megabits per second, or megahertz. The ST 506 interface has a transfer rate below 1MB per second; today's SCSI drives can reach about 5MB per second.

■ **Winchester drive** A nickname for a hard disk with a spinning platter. IBM's original PC hard disk stored 30MB on each side of a platter and was called the 3030, which reminded people of the Winchester 30-30 rifle.

■ **zone-bit recording** A storage process that arranges more sectors on the longer outer tracks of the disk but maintains a constant spin rate. It is designed to get more data on the disk but can be used only with intelligent interfaces.

**LOOK WHAT
PC MAGAZINE
HAD TO SAY ABOUT
A VERY GRAPHIC
AND RACY
SUBJECT.**

7234); or *PC Tools*, \$179, from Central Point Software (800-445-4208). But if sectors start going bad on your drive, you can no longer depend on it. It is time to consider a replacement.

When you select a new hard disk drive, there are several features to consider:

- Interfaces: ST506, ESDI, IDE, or SCSI?
- Upgrade paths: What are your options?
- Capacity: Think 100MB.
- Speed: access times and data-transfer rates.
- Physical size: Smaller is better.
- Storage density: data coding, zone-bit recording, and data compression.
- Prices: They're better than ever.

Once you have chosen your new drive, set aside an hour of solid work to install it; more-experienced users may be able to get the job done in half an hour.

INTERFACES: ST506, ESDI, IDE, OR SCSI?

It is very likely that your next hard disk will use a different interface from the one you already own. The interface is the connection between the disk drive and the system bus; it determines the speed at which data can be transferred between them. The old standby device-level interfaces, which require a controller, are being left in the dust, while the system-level interfaces, which put the controller electronics on the drive and require only a host

PERFORMANCE TIPS

▪ Defragment your disk

Every time you use your hard disk, it gets a little slower. Because DOS was written when capacity was more important than speed, it tries to pack files on-disk as conservatively as possible, dividing them into clusters and squeezing them as tightly as it can. But organizing file clusters in this way means that DOS has to search all over the disk for errant clusters, and also means easier file recovery if you delete a file by mistake.

You can reorganize your disk to put all of each file's clusters next to one another, so DOS and your disk drive do not have to search for them. The easy way to do this is with a special disk optimizer program (also termed a *disk defragmenter* or a *disk compactor*). Such programs are typically included in hard disk utility packages such as Central Point Software's *PC Tools* (\$179; 800-445-4208) and Symantec Corp.'s *The Norton Utilities* (\$179; 800-441-7234); alternatively, you can use one of a number of standalone entries.

The cheap way to reorganize your hard disk is to back up the disk, reformat it, and restore all your files. This has the side benefit of assuring that you have at least one reasonably current backup of your hard disk available.

adapter, are taking over the market.

The device-level ST506 interface fell from fashion more than a year ago. No new drives that used it were introduced—certainly not any with the speeds and capacities expected from a modern unit. The successor to ST506 is ESDI (enhanced small device interface), which is going a similar route. ESDI drives are available in quantity, but development work is being concentrated on drives with other interfaces. This may be the last year that new ESDI drives are introduced. Number-two drive maker Seagate Technology, for example, is not developing any new ESDI drives.

The two remaining interfaces—IDE (integrated drive electronics) and SCSI (small computer system interface)—are likely to be around for a while. (Originally, IDE was a generic term for any system-level interface, but most people use it to mean a system-level interface that conforms to ANSI's AT Attachment standard, which is based on the PC AT expansion bus and matches the bus in its potential throughput.) IDE and SCSI's higher-level connection allows them to exploit all the latest technologies that increase capacity and speed. The data-transfer rates of ST506 and ESDI interfaces, however, are relatively slow; they actually impede the performance of 386- and 486-based machines. (For more information on SCSI,

HOW THE INTERFACES COMPARE

For most users, the IDE interface is the best bet.

Disk interface	ST506	ESDI	IDE	SCSI
Integration	Device-level	Device-level	System-level	System-level
Transfer rate	Less than 1MB per second	Up to 2.5MB per second	Up to 4MB per second	Up to 5MB per second
PROS	Easiest upgrade path for systems with smaller ST506 drives, if low capacity and slow performance are still acceptable.	Faster than ST506; includes some advanced features. Available with large capacities and high speeds.	Faster than ST506 and ESDI. Squeezes more capacity from small drives. Available with large capacities and high speeds. The best bet for 100MB to 200MB workstation drives.	Faster than ST506 and ESDI. Squeezes more capacity from small drives. Available with large capacities and high speeds. Can support up to seven devices, including printers, CD-ROM drives, and scanners.
CONS	Slow. Hard to find except in 20MB to 40MB capacities. Modulation methods (MFM or RLL) must match; controllers and drivers are not always compatible.	Slower than IDE and SCSI. Increasingly hard to find. Data-transfer rates must match.	Early specification ill-defined; compatibility with other drives not guaranteed. Switching to another interface requires disabling circuitry on the system board.	Different vendors implement different options, resulting in compatibility and installation headaches.

“The DECpc 433
mixes top PC performance
with networking and blazingly fast
video performance.”

PC Magazine
October 15, 1991



Pretty hot stuff, huh? And that's not all *PC Magazine* felt fit to print about our DECpc™ 433

Workstation. Just get a load of this: "The DECpc 433 adds value to the existing standard without sacrificing compatibility. What's more, this machine shows strength in an area where DEC knows a thing or two: the graphics workstation market."

And how about this: "At \$5,999*... [this] machine is a PC designer's dream."



Of course, far be it from us to censor one of the best PC sources in the business. Especially when it comes to this quote (our favorite): "If graphics speed is important to you, give the DECpc 433 a long hard look."

Naturally, we encourage you to take them up on this suggestion.

For more information on the DECpc 433, or any PC in Digital's line, call 1-800-DIGITAL, ext. 417. Or talk to your local Digital Authorized Distributor.

digital™

D I G I T A L . T H E O P E N A D V A N T A G E

© Digital Equipment Corporation, 1992. The DIGITAL Logo and DECpc are trademarks of Digital Equipment Corporation. 486 and Intel Inside are trademarks of Intel Corp. * U.S. Price.

COMPUTER BOOKS AT 25% DISCOUNT

- ★ Save 25% off Cover Price of every book.
- ★ 30-Day Money-Back Guarantee.*
- ★ Every Title from eight top computer book publishers stocked for immediate shipment.
- ★ Not a "Book Club" with limited availability.

- ★ No long-term purchase commitment.
- ★ No "Automatic" shipments of books you did not order, or cards to mail every month.
- ★ No artificially high "Shipping & Handling Charges" inflating actual cost of books.

WordPerfect® For Windows Books

With for WordPerfect® for Windows finally released, make-up for the long wait by coming up to speed fast with one or more of the following books on the Windows version of this #1 word processing software.

10 Minute Guide to WordPerfect for Windows; Murray	Sams 160 pp., \$ 9.95	#30031	\$ 7.47
Desktop Publishing with WordPerfect - Win. Edition; Parker	Ventana 350 pp., 21.95	#94076	16.47
Illustrated WordPerfect for Windows;			
Wordware 300 pp., 24.95	#55234	18.72	
Looking Good with WordPerfect for Windows; Que Dev.	Que 450 pp., 24.95	#80814	18.72
The First Book of WordPerfect for Windows; Barnes	Sams 400 pp., 16.95	#27343	12.72
Using WordPerfect for Windows; Que Development	Que 850 pp., 29.95	#80556	22.47
WordPerfect for Windows Bible; Baale-Kelly & Blodgett	Sams 1000 pp., 29.95	#30101	22.47
WordPerfect for Windows Quick Reference; Que Development	Que 160 pp., 9.95	#80785	7.47
WordPerfect for Windows QuickStart; Harvey	Que 400 pp., 19.95	#80712	14.97
WordPerfect for Windows: Visual QuickStart Guide; Webster	Peachpit 275 pp., 14.95	#15194	11.22
WordPerfect for Windows: Visual QuickStart Guide; Webster	Peachpit 275 pp. plus diskette, 32.95	#15195	24.72

Art of Desktop Publishing

Desktop Publisher's Dictionary; Bonura	Wordware 456 pp., \$21.95	#55106	\$16.47
Looking Good in Print, Second Edition; Parker	Ventana 371 pp., 23.95	#94032	17.97
Newsletters from the Desktop; Parker	Ventana 306 pp., 23.95	#94040	17.97
The Desktop Publisher's Survival Kit; Blatner	Peachpit 176 pp. + disk, 22.95	#15176	17.22
The LaserJet Font Book; Pfeiffer	Peachpit 332 pp., 24.95	#15108	18.72
The Gray Book; Gosney, Odum & Schmal	Ventana 224 pp., 22.95	#94050	17.22
The Makeover Book; Parker	Ventana 282 pp., 17.95	#94020	13.47
The Publish Book of Tips; Eckhardt, Weibel & Nace	Peachpit 450 pp., 24.95	#15174	18.72
Type from the Desktop; Burke	Ventana 226 pp., 23.95	#94045	17.97
TypeStyle: How to Use Type on a PC; Will-Harris	Peachpit 320 pp., 24.95	#15123	18.72

VisualBASIC

The First Book of Visual Basic Progr.; Orvis	Sams 500 pp., \$19.95	#27382	\$14.97
Visual Basic How-To; Waite & Arson	Waite Group 500 pp. + disk, 34.95	#73909	26.22

Best Sellers

Using 1-2-3 2.3 for DOS, Special Ed.; Que Dev	Que 900 pp., \$29.95	#80727	\$22.47
Using 1-2-3 3.1+ for DOS, Special Ed.; Que Dev.	Que 975 pp., 29.95	#80843	22.47
Using Ami Professional 2; Meade	Que 600 pp., 24.95	#80738	18.72
1,000 AutoCAD 10 & 11 Tips & Tricks; Head	Ventana 581 pp., 24.95	#94053	18.72
Inside AutoCAD 10 & 11, Spec. Ed.; Raker & Rice	New Riders 1072 pp., 34.95	#05020	26.22
Using dBASE IV 1.1; Que Dev.	Que 987 pp., 29.95	#80551	22.47
Using Excel 3 for Windows, Special Ed.; Person	Que 900 pp., 29.95	#80685	22.47
Using Harvard Graphics 3; Sandlar & Sagman	Que 700 pp., 29.95	#80735	22.47
Using Microsoft Word 5.5; Pfaffenberger	Que 702 pp., 24.95	#80642	18.72
Using Norton Utilities 6; Elliot	Que 550 pp., 26.95	#80861	20.22
Using PageMaker 4 for Windows; Burns & Venit	Que 500 pp., 29.95	#80645	22.47
Using Paradox 3.5, Special Ed.; Bruce	Que 750 pp., 29.95	#80789	22.47
Using PC Tools Deluxe 7; Bruce	Que 700 pp., 24.95	#80733	18.72
Using Quattro Pro 3, Special Ed.; Burns	Que 750 pp., 24.95	#80721	18.72
Using Quicken 4: PC Version, 2nd Ed.; Nelson	Que 525 pp., 19.95	#80644	14.97
Using WordPerfect 5.1, Special Ed.; Que Dev.	Que 900 pp., 27.95	#80554	20.97
Fractal Creations; Wegner & Peterson	Waite 350 pp. + disk, 34.95	#73905	26.22

C++ Books

Borland C++ 2.0 Object Oriented Prog.; Faison	Sams 650 pp., \$29.95	#30004	\$22.47
Borland C++ Prog. Guide to Graphics; McCord	Sams 800 pp., 29.95	#30201	22.47
Borland C++ Programmer's Reference; McCord	Que 900 pp., 29.95	#80714	22.47
C Programming Using Turbo C++; Lafore	Sams 794 pp., 29.95	#22737	22.47
C++ Primer Plus; Prata	Waite Group 600 pp., 26.95	#73902	20.22
The Waite Group's C++ Programming; Berry	Sams 336 pp., 29.95	#22619	22.47
Dev. Win. Apps. with Borland C++ 2.0; McCord	Sams 1000 pp., 29.95	#30231	22.47
Graphical User Interf. with Turbo C++; Faison	Sams 290 pp., 29.95	#22783	22.47
Illustrated Turbo C++; Wang & Bibb	Wordware 416 pp., 21.95	#55190	16.47
Learning C++; Swan	Sams 800 pp. + disk, 39.95	#22785	29.97
Master C++; Let PC Teach You OOP; Lafore	Waite 375 pp. + 3 disks, 39.95	#73907	29.97
Object Oriented Program. in C++; Barakakati	Sams 600 pp., 29.95	#22800	22.47
Object Oriented Progr Using Turbo C++; Smith	Wordware 136 pp. + disk, 14.95	#55204	11.22
Object-Oriented Progr. in Turbo C++; Lafore	Waite Group 600 pp., 26.95	#73906	20.22
Turbo C++ Bible; Barakakati	Sams 1000 pp., 29.95	#22742	22.47
Using Borland C++; Atkinson & Atkinson	Que 1068 pp., 29.95	#80675	22.47

HOLIDAY SPECIAL!

We will pay shipping charges for all orders of three or more books (Our choice of shipping method, U.S. Destinations Only). Valid Until Jan. 15, 1992

*Terms & Policies

- No surcharge for VISA or MasterCard.
- C.O.D. orders are accepted for Cash or Certified Check payment only.
- Prices and availability subject to change without notice.
- ACTUAL shipping charges are added to all orders except prepaid Mail-Orders which are shipped free-of-charge, our choice of transportation method (U.S. Destinations only). See Holiday Special above for limited-time exception.
- You may return any book within 30 days from Invoice Date for full credit or refund provided it is unmarked and in resalable condition with "unbroken" spine (book is not forced to lay flat). Shipping charges are not refundable.

1-2-3® For Windows Books

1-2-3 for Windows Quick Reference; Que Development	Que 160 pp., \$ 9.95	#80783	\$ 7.47
1-2-3 for Windows QuickStart; Harvey	Que 500 pp., 19.95	#80723	14.97
10 Minute Guide to Lotus 1-2-3 for Windows; Sams	Sams 160 pp., 9.95	#30082	7.47
Lotus 1-2-3 for Windows Bible; Sams	Sams 1000 pp., 29.95	#30062	22.47
The First Book of Lotus 1-2-3 for Windows; Aitken	Sams 320 pp., 16.95	#27364	12.72
Using 1-2-3 for Windows; Que Development	Que 900 pp., 29.95	#80724	22.47

DR DOS 6 & MS-DOS 5 Books

The First Book of DR DOS 6; Grimes	Sams 350 pp., \$16.95	#27386	\$12.72
10 Minute Guide to MS-DOS 5; Nimersheim	Sams 160 pp., 9.95	#22807	7.47
The First Book of MS-DOS 5, 2nd Edition; Nimersheim	Sams 275 pp., 16.95	#27341	12.72
MS-DOS 5 Quick Reference; Que Development	Que 160 pp., 9.95	#80646	7.47
The Waite Group's MS-DOS 5 Bible, Fourth Edition; Simrin	Sams 1020 pp., 29.95	#22789	22.47
Que's MS-DOS 5 User's Guide, Special Ed.; Que Dev.	Que 1000 pp., 29.95	#80671	22.47



We stock every book in-print by these fine publishers of computer books. If you know the title or ISBN number of the books you are interested in, give us a call and we can process your order immediately. For a copy of our latest Book Catalog, listing more than 500 technical books, call Toll Free: (800) 421-1770.

techbooks

A Division of R/C Source, Inc.

1803 NW Lincoln Way • Toledo, OR 97391

Hours: 6 A.M. to 5 P.M. PST Mon. - Fri.

(800) 421-1770

Phone: (503) 336-2222

Fax: (503) 336-4400



Haven't You Heard the News?



You don't have to buy the whole newsstand to get copies of your latest article or review. Order customized reprints from Ziff-Davis Publishing Co. and let potential clients read all about it.*

To find out how you can have your article or review reprinted, contact Claudia Crichlow—Reprints Manager; Ziff-Davis Publishing Company, One Park Ave., New York, NY 10016, 212-503-5447 or 212-503-5412. * Minimum quantity 500 reprints.

HARDWARE

HARD DISKS

when you add a second drive. For instance, you might want to add a new SCSI drive to a system that already has an ST506 unit, though you might occasionally encounter unpredictable hardware incompatibilities between some products. Be sure to install the BIOS for the new controller or host adapter (not to be confused with the system BIOS) in an alternative address range. Generally, the BIOS for the first host adapter is located at C8000(Hex); your second host adapter should allow you to use a DIP switch or jumper to relocate its BIOS to a secondary address, such as D0000(Hex) or D8000(Hex).

When upgrading hard disks, don't forget about your floppy disk drives. Disk controllers for middle-aged computers, from the AT to the last generation of 386s, have combined the hard disk and floppy disk drive controllers. Earlier machines used separate boards for each; current machines are likely to use IDE interfaces on the system board. If you have one of these middle-aged machines and want to upgrade, you will have to be sure to get floppy disk control circuitry on your new host adapter controller, or get a dedicated controller board for your floppy disk drives to accompany your new host adapter.

CAPACITY: THINK 100MB

One important feature to consider is capacity. No one makes 10MB drives anymore, and 20MB units have become specialized products—miniatures, designed for the confines of laptop and smaller computers. Full-size 5.25-inch drives storing 20MB are as obsolete as your DOS 2.0 system disks.

The smallest drive you'll find will likely have a capacity of 40MB and be available for under \$200. For example, a bare Kalok KL343 was recently advertised for \$180; a Conner CP3000, \$215. While these were once the most popular upgrades, expectations have risen and costs have fallen so that today 60MB to 80MB drives are the most in demand. These drives come in at a popular price point (just under \$300) through mail-order channels; for example, a Maxtor Cheyenne 7080A lists for \$290, while a Seagate ST296N lists for \$280.

For most desktop users, the right size is 100MB. That gives you enough storage for 30MB worth of applications (for example, half a dozen Windows apps, each requiring 4MB to 6MB), plus another 30MB

MBargain.



Once again, Seagate is giving you more bytes for your buck... with the first low-profile 3.5-inch drive to offer more than 100 MB in the same price category as 80 MB drives.

The 1" high ST3120A offers 106 formatted megabytes—25% more than competing drives—with an AT interface. It features the latest advances in caching design and dedicated servo

Now 100 megabytes
cost what you've been
paying for 80.

technology for an extra-fast 15ms seek time. And its low power requirements, low noise level and great Seagate reliability make it the perfect choice for desktop and portable systems.

So why scrimp on capacity... when you can drive a hard MBargain with Seagate? For full product specifications, call us at 800-468-DISC or 408-438-6550.

 **Seagate**

The first name in disc drives

for accompanying data files, and another 30MB or more for expansion. Three years ago, \$300 to \$400 would have bought you a 4MB half-height 5.25-inch drive with a 40-millisecond average access time. For the same amount of money today, you'll get a 100MB 3.25-inch drive with a faster interface, a higher data-transfer rate, and a 20-ms. average access time. (Most 100MB drives cost around \$380 through mail-order channels.)

You will want more megabytes if you have definite workstation or server plans for your PC. Server-size drives start where single-user products stop. You will want at least 100MB, but serious work requires more. About 330MB is today's favored size, because units are available at about \$1,000 (the 340MB Maxtor LXT-340A, for example, is priced at about \$1,049 through mail-order channels). For larger systems, the variety of 600MB and larger drives is steadily increasing, and drives larger than 1 gigabyte are commonly available.

For single-user systems, you won't want to go entirely wild with capacity; DOS still has its limits. DOS 5.0 increased the partition size from 512MB to 2GB, but it still cannot address more than 1,024 cylinders in a single disk drive. If you are willing to stray from standard DOS, packages such as *SpeedStor*, \$99.95, from Storage Dimensions (408-954-0710), or *Disk Manager*, \$124.95, from Ontrack Computer Systems (800-752-1333), will give you some flexibility but may cause problems in some applications and environments. Moreover, drives are working around DOS's limits by faking cylinder counts that are below 1,024.

Some new IDE drives offer a translation mode in which they automatically configure themselves to emulate the number of heads and cylinders required by your PC, no matter what type of physical arrangement they actually use on the disk. With network file servers, however, you will not have to worry about these issues, because the DOS limits do not apply, even when DOS-based network stations share the server's disks. Most servers simply do not run DOS.

As for speed, get the fastest drive you can handle. A fast PC demands a fast hard disk; if you have a 486-based machine, you should get a 15-ms. to 16-ms. disk. Although a slow PC might not absolutely need such a fast drive, it can still benefit from one. Its response will improve on disk-intensive tasks.

SPEED: ACCESS TIMES

Mass storage speeds have only gotten faster over the years. But the average access times of PC-size hard disks may be bottling out. Check the specifications and you will see most of today's better hard disks lodged near an average access time of 15 ms. And according to Seagate, that's about all you need. System overhead in disk transfers is such that faster disk drives will not appreciably improve system response.

All the issues the cognoscenti used to worry about when selecting a hard disk no

longer apply. You don't need to fret about what kind of head actuator is in a new hard disk. All of the latest generation of drives use servo voice-coil technology, and stepper motors today are found only in close-out products. You don't have to worry about protective features such as automatic park-and-lock and hard-plated magnetic media. They are both standard in all new hard disks.

Newer disks are getting faster. While they aren't getting appreciably quicker in finding data, they are ushering it into your PC at an ever-increasing clip. Data-transfer rates continue to climb for a number of reasons, including faster spins, faster interfaces, and internal caches. The first and last of these will also help improve effective access times, without accelerating actual head movement.

Hard disks have always spun their platters at a nearly universal 3,600 revolutions per minute. That speed just happens to be a good choice for AC motors. Synchronous motors spinning at that rate, for example, easily lock to the 60-Hz rate of the power line.

Disk drives have not used synchronous AC motors for years; PC-size drives never used them at all. Instead, they use servo-controlled DC motors that could be run effectively at any speed. The entire hard disk system was engineered around this speed, however, with the rate at which data was read from the disk and the density of data storage both locked to the 3,600-rpm speed. Both the ST506 and ESDI interfaces are, in effect, locked to the 3,600-rpm rate.

The higher-level interfaces, IDE and SCSI, are not. They process the raw data coming from the disk and can accept raw data at any rate their designer elects to use. The designer has a couple of compelling reasons to consider faster spins. The higher the rotational rate of the disk, the lower its average latency. (Latency is the time it takes for the disk to spin to the proper radial position to read the data you want. On the average, latency amounts to the time required to spin the disk halfway around: 8.33 ms. at 3,600 rpm.) In addition, data can be read from the disk faster at a given storage density, because the faster spin will push more flux transitions under the read/write head in a given period.

Of course, disks cannot spin infinitely fast. At really high speeds, they run the risk of ripping themselves apart because of centrifugal force. But a modest speed increase is not out of order. In fact, 4,500

PERFORMANCE TIPS

■ Add a disk cache

The most effective software acceleration you can give your hard disk is a disk cache. This cache dynamically duplicates part of the contents of your hard disk in fast RAM so it can be read (and sometimes written to) at RAM speed. Unlike buffers, the disk cache has a memory management scheme that attempts to anticipate your programs' requests for disk data, typically by retaining the data you've most recently accessed, under the assumption that this is what you are most likely to need next. Disk caches are generally more versatile than a RAM disk because they are larger. However, software disk caches may demonstrate incompatibilities with some applications.

Microsoft includes a disk cache called SMARTDRV.SYS with both *Microsoft Windows 3.0* and *DOS 5.0*, which supports flexible memory handling (the cache can temporarily loan RAM to applications). Commercial disk-caching programs such as MultiSoft Corp.'s *PC-Kwik Power Pak* (\$129.95; 800-395-5945) or Central Point Software's *PC Tools* (\$179.00; 800-445-4208)—or even a free program like DCACHE.COM, available on PC MagNet—are typically more efficient and offer greater speed-up potential. If you don't opt for a free shareware program, plan on spending up to \$100 for a commercial package, plus \$50 to \$100 for a RAM upgrade if you need one.

Another alternative is a caching disk controller. This hardware approach to disk caching, however, is expensive (between \$700 and \$1,800) and doesn't always offer a noticeable speed improvement over software disk caching in standalone user applications. (For more information, see "Caching Controllers: Hard Disk Access in No Time Flat," June 12, 1990.) In an upcoming story, we will explore caching disk controllers in the server environment.

**Attention
1st class
customers.**

**Swan
announces
another
major
departure.**



We've lowered our prices But you still get 1st

If you've been waiting for the right moment to buy a new computer, that time is right now.

Starting today, you can get a top quality Swan system—and our award-winning service and support—for up to \$300 less than before.

And there are more high-performance Swan systems to choose from. Which means you can now order exactly the system you want, save money, and get the 1st class service that made us famous—for free!

The computers you want

Pull the cover off any Swan computer and look around. You'll see names like Intel, Sony, Hewlett Packard and Quantum on the drives, chips and other components we use.

Bill Machrone, former Editor-in-Chief of PC Magazine said it best: "Swan's engineers clearly demonstrated that the time of building PCs with whatever parts are cheapest is over."

At Swan, we don't just build computers. We build value.



Swan 386SX/20

- ▲ Intel 80386SX-20™ System
- ▲ 1MB RAM
- ▲ 50MB 17ms IDE Hard Drive
- ▲ 12" Monochrome Monitor
- ▲ 5.25" or 3.5" Floppy Drive
- ▲ Ports: 2 Serial, 1 Parallel
- ▲ 7 Expansion Slots: 6) 16-Bit, 1) 8-Bit
- ▲ 101-Key Keyboard **\$1195**

2MB Performance System

- ▲ Intel 80386SX-20™ System
- ▲ 2MB RAM
- ▲ 50MB 17ms IDE Hard Drive
- ▲ VGA (1024 x 768) Monitor
- ▲ 1MB VGA Palette Plus Card
- ▲ Both 5.25" and 3.5" Floppies
- ▲ Swan Mouse and Mousepad
- ▲ 101-Key Keyboard
- ▲ Windows 3.0
- ▲ DOS 5.0 **\$1895**

Special Limited Time Offer!

386SX/20 Holiday Express System

- ▲ 2MB RAM
- ▲ 50MB 17ms IDE Hard Drive
- ▲ VGA (640 x 480) Monitor
- ▲ Swan VGA Card (640 x 480)
- ▲ 5.25" Floppy Drive
- ▲ Swan Mouse and Mousepad
- ▲ 101-Key Keyboard
- ▲ Microsoft Works for Windows
- ▲ Windows 3.0
- ▲ DOS 5.0 **\$1795**

Save \$99



Swan 386/25

- ▲ Intel 80386DX-25™ System
- ▲ 1MB RAM
- ▲ 50MB 17ms IDE Hard Drive
- ▲ 12" Monochrome Monitor
- ▲ 5.25" or 3.5" Floppy Drive
- ▲ Ports: 2 Serial, 1 Parallel
- ▲ 8 Expansion Slots: 6) 16-Bit, 2) 8-Bit
- ▲ 101-Key Keyboard **\$1295**

2MB Performance System

- ▲ Intel 80386DX-25™ System
- ▲ 2MB RAM
- ▲ 50MB 17ms IDE Hard Drive
- ▲ VGA (1024 x 768) Monitor
- ▲ 1MB VGA Palette Plus Card
- ▲ Both 5.25" and 3.5" Floppies
- ▲ Swan Mouse and Mousepad
- ▲ 101-Key Keyboard
- ▲ Windows 3.0
- ▲ DOS 5.0 **\$1995**

4MB Power System

- ▲ Same features as above with 4MB RAM and 100MB hard drive **\$2295**



Swan 386/33

- ▲ Intel 80386DX-33™ System
- ▲ 4MB RAM, 128K SRAM Cache
- ▲ 100MB 17ms IDE Hard Drive
- ▲ 12" Monochrome Monitor
- ▲ Both 5.25" and 3.5" Floppies
- ▲ Ports: 2 Serial, 1 Parallel
- ▲ 8 Expansion Slots
- ▲ 101-Key Keyboard
- ▲ DOS 5.0 **\$1995**

4MB Performance System

- ▲ Intel 80386DX-33™ System
- ▲ 4MB RAM, 128K SRAM Cache
- ▲ 100MB 17ms IDE Hard Drive
- ▲ VGA (1024 x 768) Monitor
- ▲ 1MB VGA Palette Plus Card
- ▲ Both 5.25" and 3.5" Floppies
- ▲ Swan Mouse and Mousepad
- ▲ 101-Key Keyboard
- ▲ Windows 3.0
- ▲ DOS 5.0 **\$2495**

4MB Power System

- ▲ Same features as above with 200MB 16ms IDE hard drive **\$2995**



Swan 486SX

- ▲ Intel i486SX-20™ System
- ▲ 4MB RAM, 8K Internal Cache
- ▲ 220MB 12.6ms IDE Hard Drive
- ▲ 12" Monochrome Monitor
- ▲ Both 5.25" and 3.5" Floppies
- ▲ Ports: 2 Serial, 1 Parallel
- ▲ 8 Expansion Slots
- ▲ 101-Key Keyboard
- ▲ DOS 5.0 **\$2495**

4MB Performance System

- ▲ Intel i486SX-20™ System
- ▲ 4MB RAM, 128K SRAM Cache
- ▲ 120MB 15ms IDE Hard Drive
- ▲ VGA (1024 x 768) Monitor
- ▲ 1MB VGA Palette Plus Card
- ▲ Both 5.25" and 3.5" Floppies
- ▲ Swan Mouse and Mousepad
- ▲ 101-Key Keyboard
- ▲ Windows 3.0
- ▲ DOS 5.0 **\$2695**

4MB Power System

- ▲ Same features as above with 220MB 12.6ms IDE hard drive **\$3095**



The systems marked with the Swan Express symbol have been built, thoroughly tested and are ready to be shipped to you immediately. Other configurations available. Call for details.

S=L2A4

1-800-468-9044

and widened our selection. class service for free.

The service you deserve

Fact: In PC Magazine's most recent Service and Reliability Survey, Swan took top honors in brand loyalty, technical support and repair service.

Fact: Swan is the only major direct marketer with a free on-site two-year warranty on every 286, 386 and 486 desktop computer we sell.

Fact: If you think you deserve 1st class service on your computer system, there's just one company to call—Swan.

The selection you expect

Why limit your choices to just a few pre-configured models? Swan offers you one of the widest varieties of CPUs, drives, displays and options in the business.

Like three road-ready notebooks. And five different 486s, from the amazingly low cost 486SX, to our lightning fast 486/33E.

Best of all, if you don't see precisely the system you want on these pages, call us. We'll help you configure your dream machine right on the phone. And we'll save you money.



Swan 486/33

- ▲ Intel i486-33™ System
- ▲ 4MB RAM, 64K Internal Cache
- ▲ 220MB 12.6ms IDE Hard Drive
- ▲ 12" Monochrome Monitor
- ▲ Both 5.25" and 3.5" Floppies
- ▲ Ports: 2 Serial, 1 Parallel
- ▲ 8) 16-Bit Expansion Slots
- ▲ 101-Key Keyboard
- ▲ DOS 5.0

\$2895

8MB Performance System

- ▲ Intel i486-33™ System
- ▲ 8MB RAM, 128K SRAM Cache
- ▲ 120MB 15ms IDE Hard Drive
- ▲ VGA (1024 x 768) Monitor
- ▲ 1MB VGA Palette Plus Card
- ▲ Both 5.25" and 3.5" Floppies
- ▲ Swan Mouse and Mousepad
- ▲ 101-Key Keyboard
- ▲ Windows 3.0
- ▲ DOS 5.0

\$3395

8MB Power System

- ▲ Same features as above with 220MB 12.6ms IDE hard drive

\$3695



Swan 486/33E*

- ▲ Intel i486-33™ System
- ▲ EISA Systemboard With 4MB RAM, Expandable to 64MB
- ▲ 8K Internal Cache, 128K External Cache Standard, Expandable to 256K
- ▲ 220MB 12.6ms IDE Hard Drive
- ▲ Award BIOS
- ▲ Flash EPROM Support for End-User BIOS Upgrades
- ▲ Shadow RAM for Video and BIOS
- ▲ 12" Monochrome Monitor
- ▲ Both 5.25" and 3.5" Floppies
- ▲ 200 Watt Power Supply
- ▲ Weitek 4167 Coprocessor Socket
- ▲ 5 Exposed 5.25" and 2 Internal 3.5" Device Bays
- ▲ Ports: 2 Serial, 1 Parallel
- ▲ 8) 32-Bit EISA Expansion Slots: 6 Bus Masters, 2 Bus Slaves
- ▲ 101-Key Keyboard
- ▲ DOS 5.0

\$3295

* Optional tower case pictured includes 300 watt power supply, dual cooling fans and 7 device bays—add \$200. Available for 386/33 and all 486 systems



Swan 386SX/20 Notebook

- ▲ Intel 80386SX-20™ System
- ▲ 2MB Standard, Expandable to 4, 6 or 8MB
- ▲ 40MB 23ms IDE Hard Drive
- ▲ Built-in 3.5" Floppy Drive
- ▲ Triple Super Twist CCFL Sidelit LCD Screen, 640 x 480 Resolution, 64 Gray Shades
- ▲ Removable NiCad Battery with 2.5 Hour Life Typical; AC Adapter Included
- ▲ 80-Key Keyboard
- ▲ External VGA Port
- ▲ Ports: 1 Serial, 1 Parallel, PS/2 Mouse, DC In, External Numeric Keypad
- ▲ Slots: Internal Fax/Modem, Internal Memory Card
- ▲ 80387 Coprocessor Socket
- ▲ 1-Year Warranty
- ▲ MS-DOS

\$1995

Also Available...

- ▲ 386SX/20 Notebook with 60MB 23ms IDE Hard Drive

\$2195

At last, a notebook good enough to be your full-time computer.

The new Swan 20MHz 386SX Notebook takes portable computing where it's never been before. Small enough to fit in your briefcase. Light enough to go anywhere. Yet so powerful, expandable, and usable, you'd be happy to use it all the time.

Choose our newest system, the Swan 386SX/20, and you get a full 2MB of RAM as standard equipment. Buy your Swan Notebook right off the page and you're ready to run Windows everywhere you go.

Features you won't find elsewhere.

Unmatched VGA Video

64 shades of gray provide outstanding clarity for sharp, clear text and images. The competition is no rival with just 32 shades. The liquid crystal CCFL (Cold-Cathode Fluorescent Lamp) non-glare screen has a resolution of 640 x 480.

Customer Installable Upgrades

Swan will gladly upgrade your Notebook at the time of purchase. If you later decide to add optional equipment, we don't require you to return your Notebook to the factory like our competitors do. You can quickly and easily install the options yourself.

Unequaled Power Management

The Swan Notebook is equipped with four user-controlled power management features to reduce battery power consumption. Other notebooks that use only two levels deplete the battery more quickly. Swan's battery will supply power for up to 50% longer.



Intel Inside is a trademark of Intel Corporation



1-800-468-9044

S-L2A4

We're out to win your business.



Bob Timney
Government Sales

Leslie Peters
Corporate and
Education Sales

Dick Trudel
Vice President
Sales and Service

Todd Cardamone
Technical Support

Joanne Waigand
Sales Consultant

The people of Swan are committed to delivering top quality systems at low prices. And most of all, giving you the best service and support you'll find anywhere.

Here's why it really does cost less to go 1st class with Swan:

1 Exclusive Two-Year On-Site Warranty

There's no better way to protect your investment than the industry-leading Swan Two-Year On-Site Warranty that covers every 286, 386 and 486 desktop system we sell. Compare this to other companies who charge up to \$200 for the same coverage. As a Swan customer, you can feel secure that your investment will be protected with the best warranty in the business.

2 30-Day Money-Back Guarantee

If you're not completely satisfied with any Swan brand product you buy—whatever the reason—simply return it within 30 days for a complete refund, no questions asked. We're committed to your satisfaction.



Call today for our free catalog!

Featuring a full selection of systems, printers, monitors, video cards, modems, drives, accessories, software and much more. All at great savings!

3075 Research Drive
State College, PA 16801

*GSA Contract#: GS00K90AGS5325-OPT YR1

*Remote locations may incur additional charges.

3 Award-Winning Technical Support, Open Every Day

Tired of sitting on hold, or waiting for someone to call back "tomorrow"? Call Swan and you'll get right through to what PC Magazine calls, "Swan's remarkable support system." You'll talk to one of the best-trained, most knowledgeable support people in the business.

4 Flexible New Business Leasing Program

Not only do we save you money, we can also help you conserve capital by spreading your payments out over time. Payments are fixed for the term of your lease, and are fully deductible within IRS guidelines.

5 Corporate, Education and Government* Customer Programs

We've got a special dedicated sales team thoroughly trained to serve the unique needs of our rapidly growing base of corporate, education and government customers. Call toll-free 1-800-533-1131.



Read what the industry experts have to say about Swan

"Swan earned top honors...these ratings mean Swan managed to make and keep its users happier than any other PC manufacturer."



Service and
Reliability Survey
September 25, 1990

"Swan's engineers clearly demonstrated that the time of building PC's with whatever parts are cheapest is over."



Bill Machrone,
Editor-in-Chief,
September 11, 1990

"Swan Technologies is wringing thunder and lightning out of the (486) chip... silently ridiculing 486 machines that are less well endowed or can't match Swan's price."



October 1990

"Not only does it (386/25) look good, the small board uses the latest, most reliable design and manufacturing techniques...it's faster than other uncached machines tested."



November 1990

"Swan's computer (386/33) may have lost some of its price, but it hasn't lost a dime's worth of quality."



August 1991

• No surcharge on credit card orders. • Your credit card is not charged until your order is shipped. • Software or accessories orders over \$100 and under 6 lbs will be shipped Federal Express. • Orders for in-stock items received before 3pm EST will be shipped same day...and each order is insured at no cost to you! • 3% or \$5 minimum for UPS Ground. Call for shipping charges on Express Air, APO, FPO, AK, HI and all foreign orders. • If part of your order is backordered, the remainder will be shipped UPS Ground. • Allow 2 weeks for all checks to clear. • ALL SALES (except Swan brand products) ARE FINAL. Items returned must be as-new, without modification or damage. All warranty cards, manuals, and packaging material must be included. Return shipping must be pre-paid and insured, bearing an RA# on the shipping label. • Shipping and upgrade fees are non-refundable. • Defective items replaced or repaired at our discretion. • PA deliveries add 6% sales tax. • Prices & terms subject to change without notice. • Products may differ from photos. • TRW service available for continental U.S., Puerto Rico and Hawaii—additional mileage charges may apply.

Where it costs less to go 1st class.

1-800-468-9044

rpm is developing into a new rotation standard (resulting in an average latency of 6.7 ms.). The Seagate ST41600N Elite drive, a 1.3GB SCSI-based 5.25-inch hard disk, spins at 5,400 rpm (about a 5.5-ms. average latency).

SPEED: DATA-TRANSFER RATES

For interfaces, the times are also changing. The peak data-transfer rate of ST506 is less than 1MB per second. ESDI ranges from 1.25MB to 2.5MB per second, depending on the drive and controller. Both of these are raw transfer rates, because both data and housekeeping information—such as sector identifications, which are later stripped out from the data stream—must be transferred through the interface. The 8-bit incarnation now used allows for rates of about 4MB per second—a calculation based on an 8-bit bus operating at 8 MHz and requiring two bus cycles per transfer. Current implementations of SCSI can reach about 5MB per second. Even the best of today's drives cannot keep up with these transfer rates.

Neither the current implementation of IDE nor SCSI, however, represents the limit of the interface technology. The AT interface can be readily expanded to a 16-bit connection, doubling its effective throughput. Several improvements to SCSI are entering from the wings.

Long-promised SCSI-2 is already here, with products available from several manufacturers. But SCSI-2 probably isn't exactly what you suppose it to be. In its current form, SCSI-2 is mostly a software standard that mandates greater uniformity in the implementations of the command language used across the SCSI bus. In other words, SCSI-2 will help match SCSI devices with host adapters.

The speed-enhancing features of SCSI-2 are optional and have not been implemented in existing products. These features are called Fast SCSI and Wide SCSI. Fast SCSI increases the clock-handling transfers across the SCSI bus from 5 MHz to 10 MHz, doubling the potential throughput. Wide SCSI extends the 8-bit bus width of standard SCSI to 16 bits, again doubling potential throughput. Eventually, Wide SCSI may extend to 32 bits.

Hard disks with system-level interfaces can get another potential speed boost by extending on-board buffering to full-blown caches. Caches will isolate your system from the mechanical delays in the disk drive. Internal disk caches are getting

quicker and more versatile as segmented caching technology is adopted. A segmented cache divides the total cache into segments that store different types of data. The caches can be adaptive, automatically modifying the size and contents of the segments to match the way you work with your hard disk.

As with data compression, hard disks with built-in caches make external caches unnecessary and generally undesirable. Multiple caches can actually slow data access as the time for housekeeping functions accumulates among the caches. Hard disks with larger internal caches should generally be operated without any software or host adapter-based hardware caches.

In the future, you are likely to see more changes in the hard disk systems you will want to add to your PC. Disk manufactur-

Disk manufacturers are exploring a variety of inventive speed-boosting technologies.

ers are exploring a variety of inventive speed-boosting technologies. For instance, Conner is preparing a dual-pathing drive with two read/write head assemblies that allows one head to read data while the other seeks the next sector.

Drive arrays combine redundant, inexpensive hard disks to gain speed and reliability. These systems can use elevator seeking (in which the head reads multiple sector requests in the most efficient order, and then the drive sorts through the data and puts the sectors in proper order) and data striping (which divides data among disks in the most efficient manner).

Although these new technologies offer the potential of great performance increases, they don't really improve DOS's capabilities. They all depend on processing multiple requests for data, as would be generated by an advanced operating sys-

tem (such as NetWare, OS/2, or Unix), while DOS can do only one thing at a time. As PCs shift to these operating systems, you are likely to see these new technologies infiltrate your desktop computer.

PHYSICAL SIZE: SMALLER IS BETTER

Everyone agrees that sales of laptops are about to overtake sales of desktop systems, though not everyone agrees on how quickly. Some industry prognosticators predict that it will happen in the new year; others say 1993. Meanwhile, PC makers are begging for more storage in smaller drives that consume less power.

Small-footprint computers rely on 3.5-inch drives; some machines even require low-height 3.5-inch drives (1 inch high or smaller). Fortunately, 5.25-inch drives are essentially obsolete, except for server-size units. Today, just about any capacity you would want in your system is available in a 3.5-inch package, all the way up to a gigabyte. But most 3.5-inch drives are 200MB or under; if you want more capacity, you will have fewer choices. IBM and Toshiba recently brought out 1GB 3.5-inch drives; other makers will shift into these product lines in early 1992.

Smallness has its advantages. Primary among them, small drives fit—not just in laptop and notebook computers, but also in the even smaller palmtops and subnotebooks. At one time, 3.5-inch drives were considered miniature, but today's tiniest platters are 1.8 inches in diameter—the "third-height" form factor. And whereas the standard 3.5-inch form factor measured 1.6 inches high, newer drives fit bays that are 1 inch high or smaller. Some drives are aiming for half that height. Drives measuring 2.5 inches and smaller are likely to fit a half-inch-high (12-millimeter) package.

In addition, smaller drives consume less power. That promises not only longer battery life for portable computers but also longer, quieter operation for desktop machines. Lower power consumption means less heat generated and cooler operation. Heat is the natural enemy of electronic circuitry, so cooler drives will likely prevail in the long run. Cooler drives, coupled with relatively watt-frugal microprocessors such as the Intel 386SL and AMD 386SXL, offer the potential of desktop computers without power supply fans and the noise they generate.

Smallness also brings the advantage of smaller parts, particularly in the head actuator. Smaller means lighter and lower in

inertia when it comes to these electromechanical assemblages; this translates into potentially quicker excursions between tracks and lower average access times.

STORAGE DENSITY

The problem with smallness is fitting everything in. The issue is *areal density*, the amount of data that can be squeezed into a storage area of a given size on a disk platter. To maintain a reasonable capacity on a disk drive, the areal density must be increased. For example, today the highest areal densities are about 100 megabits (Mb) per square inch. To shoehorn 60MB onto a 2.5-inch disk, areal densities of about 130Mb per square inch are necessary. For 80MB, you need 160Mb to 180Mb per square inch. These densities are pushing current disk technologies to their limits.

The storage density of a hard disk depends on several factors, the most important of which are the magnetic recording medium itself and the read/write head and its relationship to the drive's platters. Today's most common hard disks use Winchester technology or a derivation of it, which is based on a flyweight read/write head that flies several microinches (millionths of an inch) above the surface of the disk platter, kept airborne by the currents kicked up by the spin of the platters. Flying the head has important advantages; not the least is the lack of friction between the nearly stationary head (which moves only laterally) and the disk, which rapidly spins longitudinally.

The higher the head flies, the lower the potential storage density. As with everything else that is electromagnetic, the fields from the magnetic media of the disk spread out in all dimensions, encompassing a larger space at lower intensity under the dictates of the infamous inverse-square law. The challenge is to get the head as close to the magnetic surface as possible without compromising the integrity of the data stored there (as with a head crash).

The mechanical properties of the platter and the medium that coats it stand in the way of closer approaches. Platter surfaces are not perfectly smooth. In fact, on a microscopic scale, the surface looks more like the Sierra Nevada mountains than a smooth mountain lake. The head has to fly high enough to miss the peaks. On 3.5-inch drives, that is typically about 10 microinches; on 2.5-inch drives, the clearance may be half that.

Actually, the surfaces of hard disk plat-

HARDWARE HARD DISKS

ters are carefully designed not to be perfectly smooth. All have a degree of controlled roughness, textured into the platter before it is plated with its magnetic medi-

PERFORMANCE TIPS

■ Optimize buffers

The first rule is to optimize the number of buffers in your CONFIG.SYS file. DOS 4.x and 5.0 allocate the number of buffers in your system according to how much RAM you have installed, though if you have a large hard disk, even Microsoft recommends higher buffer counts than the DOS defaults. With 640K or more of RAM, DOS defaults to 15 buffers (a buffer contains 512 bytes plus 16 for overhead). For hard disks up to 40MB, Microsoft recommends a setting of 20 buffers; up to 80MB, 30 buffers; up to 120MB, 40 buffers; and for 120MB and larger disks, 50 buffers.

On the other hand, if you use disk caching (and you should, whether in hardware or software), you should minimize the number of buffers your system uses. While many programs advise that you eliminate the BUFFERS statement from your CONFIG.SYS file, this will simply leave you with the DOS default; you will gain more DOS memory for your system by specifying a minimal number of buffers, such as two.

um. (Virtually no disks are coated with soft oxide anymore; they are now sputtered, or plated, with metal film.) Ideally, the platter would be flat within 1 microinch of perfection. But perfect flatness would cause the head to stick to the platter. The controlled coarseness results in less of the magnetic material contacting the head when it lands, causing less friction.

Another concern with disk platters is stiffness. Although hard disk platters are hard, they are not unbendable. Their aluminum substrates can flex microinches under the moderate stress of jostling or movement. Consequently, drive makers are exploring better substrate materials, mostly glasses ranging from windowpane material to exotic ceramics. Glass-based disks have twin advantages: They are stiffer and more resistant to flexure, and they can be smoother, offering the possibility of a finer texture and closer head flight (which translates into greater areal density).

Currently, only one manufacturer offers disks based on glass platters: Areal Technology, which makes a series of disks

that will be built into portable computers. They range in capacity from 60MB to 180MB and in speeds from 17 ms. to 19 ms. The technology is still young and has not been refined to a state where it can be used in mass manufacturing by larger organizations. But in the quest for greater data densities, there is little doubt that the day of glass platters is approaching.

Further off are other refinements and changes to the traditional hard disk, including a rethinking of the Winchester philosophy. Instead of having the head continuously flying above the disk, engineers now seriously consider pinching heads closer to the disk platters by allowing for intermittent contact between them. In 1992, Conner Peripherals expects to offer drives in which the head makes continuous contact with the disk, buffered by a thin fluid layer rather than air. Not only do such continuous-contact drives improve storage densities, they eliminate any worries about head crashes; after all, there is nothing to crash if the head is already in contact with the disk. Instead, the worry is wear, and that's the reason for the liquid, which serves as a lubricant and buffer.

DATA CODING

Even if bits cannot be packed together more tightly, disk makers are wringing more capacity from their products through more efficient use of the storage space that is already available. Among the techniques being explored are improved methods of data coding, zone-bit recording, and data compression.

Years ago, the hot debate pitted MFM storage against RLL encoding. Since the latter is more efficient at packing data on disks, there could be little doubt about which technology proved the eventual winner. RLL and its offspring are de rigueur on most of today's advanced-technology hard disks, but you would never know it. The term RLL itself is disappearing from the common computer lexicon.

RLL used to be the alternative technology, a more complex and confusing way of storing information than MFM. The latter simply assigned a flux transition (a change of state of a magnetic particle on the disk) to a bit of data. RLL works by a more complex scheme called GCR (group coded recording), where bits are packaged as groups, with each group assigned to and stored under a particular code.

In the past, you had to specify whether you wanted an MFM or RLL disk with controller to match. The older interfaces,

ST506 and ESDI, delivered the raw data stream read from the disk to the disk controller. IDE and SCSI, as system-level interfaces, hide the data stream from you and your PC, so the form of disk modulation used is invisible to you. For example, the current trend is away from the 2,7 RLL that has been common in ST506 drives to 1,7 RLL in IDE products. The latter offers several advantages, including good performance, lower error rates, and a somewhat higher data density. But you do not need to order 1,7 RLL as you would with an ST506 drive. You may never know whether the disk you choose uses it.

ZONE-BIT RECORDING

Another technology being exploited to coax greater capacities from disks is zone-bit recording. Most disk drives use *constant angular velocity* recording, in which the speed of the disk's spin is constant, so that in any given period over any given track, the head hangs over a constant-size length of track. Floppy disks, phonorecords, and CDs all use constant angular velocity recording. A more efficient technology, called *constant linear velocity*, alters the spin speed of the disk depending on how near the center tracks the read/write head lies, so that in any given period, the same length of track passes below the head. When the head is above the outer tracks of the disk, where the circumference is greater, the slower spin allows more data to be packed into each track.

Constant linear velocity recording, however, which is used by high-density media like laserdiscs, is poorly suited to hard disks. For the disk platter to be properly read or written, it must be spinning at the proper rate. Hard disk heads regularly bounce from the outer tracks to the inner tracks as your software requests them to read or write data. Slowing down or speeding up the platter to the proper speed would require a lengthy wait, perhaps seconds, which would shoot the average access time of the drive through the roof.

Zone-bit recording is the compromise. Disk spin is kept constant, but the drive alters its electronics to pack more sectors on the outer tracks. Ordinarily, this would cause havoc with familiar software, such as DOS and formatting programs, which expect the same number of sectors in every track. But because the disk interface is integrated into the drive, the physical format of the drive can be completely hidden from the software. The disk electronics translate the drive's odd format into one that is more

like that of conventional disk drives.

Currently, zone-bit recording is used by relatively few companies, because the technology is protected by patents. Moreover, it works only with intelligent interfaces, so it is less likely to be used in the small drives that would benefit most from its storage abilities.

DATA COMPRESSION

Data compression can also add extra storage without pressing data densities beyond the state of the art. Today, you can buy software-based or combined hardware-and-software systems, such as *Stacker* 2.0, \$249, from Stac Electronics (800-522-7822), that add data compression to existing PC systems. Similar systems can be built into drive electronics to add extra capacity invisibly. As with other free squeeze-in systems, embedded data compression works only with system-level interfaces.

Existing proprietary compression schemes can readily be adapted to today's drives. Because the necessary processing involved in data compression takes place in the drive hardware, it should have a minimal effect on the speed of the drive. The capacity gains from data compression can be great, nominally an improvement factor of 2, but the gains vary with the types of files stored on-disk. Programs compress only nominally, text files by about a factor of 2, and graphics immensely. (Note that internal compression in a hard disk renders add-on compression systems completely useless. Once a file is properly compressed, it cannot be compressed further.)

PERFORMANCE TIPS

■ Use DOS FASTOPEN

DOS is not the smartest operating system in the world; it is, in fact, forgetful. For example, DOS carries out a new search through the directory tree for a file every time you request it—even if you have just accessed that file.

You can speed up DOS by using its FASTOPEN command, which has been available in all versions of DOS since 3.0. FASTOPEN tells DOS to remember where it found files so that it can find them again quickly, without stepping through a tedious search. Be warned, however, that FASTOPEN requires at least 3K of RAM.

Adding compression to disk drives is no longer technically difficult. Marketing drives with compression may be the only issue yet to be broached. No standard exists for rating the capacity of a drive with hardware compression. It could be rated at its nominal, uncompressed capacity (say 40MB), at its capacity with a typical mix of file types (say 80MB), or at some optimistic and extreme figure (say, for storing graphics files of blank screens, 400MB). Most likely—or rather, most desirably—you will see 40MB to 80MB drives, rated in both uncompressed and typically compressed configurations.

PRICES: BETTER THAN EVER

Now is a good time to buy a hard disk. Competition in the market is fierce, and prices are lower than ever. IBM remains the largest manufacturer of PC hard disks in the world. Long-time number-two Seagate is facing stiff competition from Conner Peripherals. The soft economy has led to a shakeout, and some familiar names have disappeared, sometimes merging with others. Imprimis, the former drive division of Control Data Corp., has been part of Seagate since 1989. Miniscribe was absorbed by Maxtor. And in August, two drive companies took dramatic turns for the worse: On August 22, Rodime filed for Chapter 11 bankruptcy protection; and on August 29, PrairieTek Corp. suspended operation because of an inability to obtain financing. And newer companies from Japan—Fujitsu America, Hitachi America, and Toshiba America Information Systems—are pursuing the American market with aggressive prices.

While the recession has been a nightmare for the hard disk industry, it has brought a windfall to you. Drive prices have never fallen so far as fast as they did in the first half of 1991. For the last ten years, the norm in the drive industry has been that the cost per megabyte falls about 5 percent per quarter. But this year, price cuts doubled that rate, so hard disk prices have never been better than they are now.

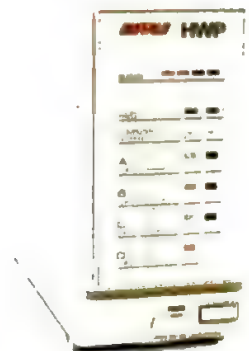
Don't expect to see the same thing next year. Drive makers have cut production and payrolls to fit the more lean-and-mean business style of this decade. Inventories and sales are coming more into line, and pricing trends will revert back to the pre-1991 norm. So right now is the best time to find bargains. ■

Winn L. Rosch is a contributing editor of PC Magazine.

Big Business Productivity For Small Workgroups



- * Pop-up Menu & Windows Option
- * Easy to Install and Use
- * Rapid Data Transfer
- * User Upgradable Memory
- * Reliable Automatic Switching
- * No PC RAM Memory Required
- * Toll-Free Technical Support
- * 45-Day Money-Back Guarantee



Printer Sharing Solutions

Model Name	Total Ports	PCs/ Printers	Memory Available	Printer Selection	Price \$ / Buffer
SL	10 6 Ser., 4 Par.	Any Combination	256KB - 4MB	Pop-up Menu	\$495 / 256KB \$595 / 1MB
SLP	10 8 Par., 2 Ser.	Any Combination	256KB - 4MB	Pop-up Menu	\$495 / 256KB \$595 / 1MB
HXM	4 2 Ser., 2 Par.	Any Combination	256KB - 16MB	Pop-up or Buttons	\$295 / 256KB \$395 / 1MB
HXS	4 Serial	Any Combination	256KB - 16MB	Pop-up or Buttons	\$295 / 256KB \$395 / 1MB
HWP	5 Parallel	3/2 4/1	256KB - 16MB	Pop-up or Buttons	\$295 / 256KB \$395 / 1MB
HXP	4 Parallel	2/2 3/1	256KB - 16MB	Pop-up or Buttons	\$245 / 256KB \$345 / 1MB
HCP	2 Parallel	1/1	256KB - 16MB	One Printer	\$225 / 256KB \$325 / 1MB
AS-41	5 Parallel	4/1	None	One Printer	\$195
AS-31	4 Parallel	3/1	None	One Printer	\$175

Save Money by Sharing Office Resources:

Printers and other expensive peripherals are idle the vast majority of the time. Buffalo boxes facilitate efficient utilization of these devices, and reduce the need to purchase more of them.

Buffalo boxes further improve productivity by allowing easy user access to all shared peripherals. With a buffer, all users can simultaneously send print data and quickly release their PCs to continue working.

BUFFALO

US and Canada Toll-Free:

(800) 345-2356

Fax (503) 585-4505

Buffalo Products, Inc.

2805 19th St. SE, Salem, OR 97302-1520

NETWORKING CD-ROMS

The Power of Shared Access

An illustration of a CD-ROM drive and several CD-ROMs. The drive is a light gray, rectangular unit with a disc tray on the front. Several CD-ROMs are scattered around it, some overlapping. The discs have a blue and silver reflective surface.

For access to large amounts of data, CD-ROMs can't be beat. And to provide that information to the most people at the lowest cost, CD-ROMs belong on the network—especially now that most CD-ROM software companies have lifted their archaic licensing restrictions. PC Magazine Labs tests CD-ROM networking alternatives from five companies.

by Ed Perratore

Information means mobility. The company that has ready access to the wealth of available statistics, forecasts, and market analyses is the one that can react most quickly to changes in its industry—or even act to initiate them.

Most often, a company's paperbound books, reports, and other publications are efficiently gathered into one or more central libraries where all authorized

employees can use them. A company that uses CD-ROM technology in its central library for storing and accessing large amounts of information is already one step ahead of the game. But having those CD-ROM drives hooked up as standalone peripherals undermines the productivity of everyone who must make a special trip from the desk to the library. And the cost involved—\$500 to \$1,000 for most CD-ROM drives, additional hundreds for a single CD-ROM database, and even more for one priced by subscription—screams for a more practical solution.

The answer is to network your CD-ROM drives. When using the right product, workstations on a *NetWare* LAN or other LAN can refer to CD-ROM drives just as they refer to any networked hard disks, and they can access the CD-ROM drives as transparently as they do local devices. A commonly used CD-ROM title can be set up on a CD-ROM drive and accessed by multiple users at the same time, or copies of that title can be made accessible to users from several CD-ROM drives. Multiple-disk titles can occupy several drives, function as a single data-

base, and support multiple users simultaneously reading from each drive.

The last time *PC Magazine* covered this topic ("Networking CD-ROMs," February 27, 1990), most CD-ROM database vendors would license only one-at-a-time use on a standalone PC, even for multiple users with access to their products. Times change. Among the many CD-ROM products now available for multiuser licensing are *Books in Print*, *Computer Library*, *Microsoft Bookshelf*, *The Original Oxford English Dictionary on Compact Disk*, *PC-SIG Library*, *Periodical Abstracts Ondisc*, *Reader's Guide to Periodical Literature*, *Standard & Poor's Corporations*, *World Atlas*, and dozens of medical titles from Silver Platter and CMC/American Medical Association.

The products we review here offer varying approaches that allow everyone on the LAN simultaneous access to a CD-ROM server's drives. The five vendor offerings we review range from software-only approaches that let you make use of

existing equipment to software and hardware combinations that provide you with a ready-to-run CD-ROM networking environment.

Included in our review are three hardware/software packages and two software products. CBIS's integrated CD Server/386 package contains a CD-ROM server tower system with a storage subsystem made up of multiple CD-ROM drives, along with a CD-ROM SCSI host adapter board and *CD Connection*, Version 2.20C. Meridian Data's CD Net Integrated System Model 314 includes a PC with a CD-ROM adapter board, five CD-ROM drives, and *CD Net*, Version 4.11. We also tested each of the integrated solutions' software, *CD Connection* and *CD Net*, on our standard test-bed. Corel System Corp.'s CorelDriver Optical Disk Interface Kit is an interface board and software combination for *NetWare* 386. Micro Design International's *SCSI Express*, Version 1.07 level A, and Online Computer Systems' *Opti-Net*, DOS Version 1.3, are software-only products. Prices range from \$795 per *NetWare* network, with unlimited users for *SCSI Express*, to \$14,475 for Meridian Data's complete CD Net Integrated System.

Although all the vendors marketing hardware/software combinations will sell the software component separately, each recommends that you buy the complete system. MDI also offers bundled options that include its software, a CD-ROM controller, and a CD-ROM drive. One-stop shopping is not only profitable for the vendor but convenient for the buyer. Also, it is easier to resolve problems when you are dealing with a single source.

The companies that sell complete tower PC systems bundled with their software say that they have tailored their drivers for optimal performance with the CD-ROM adapter they package. But our tests indicate that the software sometimes offers better performance when used with equipment other than that supplied by the company.

Though we did not require them to do so, all these products utilize some variation of the small computer system interface (SCSI) standard (explained in "SCSI: An Interface Whose Time Has Come," *PC Magazine*, October 16, 1990). As a result, you can include in certain products' daisy-chain cabling scheme other SCSI devices such as tape backup drives, optical disks, and hard disks. Meridian Data's *CD Net* can also support proprie-

HIGHLIGHTS: CD-ROM Networking

■ Most users benefit from access to CD-ROM drives, but it is expensive to put the drives on every desktop. Networking CD-ROM drives makes using this technology affordable. We review products from five companies, ranging from software-only offerings to turn-key solutions.

■ CD-ROM application titles now have reasonable network licensing policies; they didn't a year or two ago.

■ CD-ROM networking solutions generally fall into two categories: redirectors and NLM-based products.

■ Redirectors require MSCDEX or equivalent redirector software on the workstation, as well as other device drivers, utilities, or both.

■ NLM-based products such as MDI's *SCSI Express* make networked CD-ROM drives mounted volumes. *SCSI Express* takes up no RAM on the workstations.

■ *CorelDriver* uses an approach that is somewhere between the pure redirector and complete NLM-based solutions. It requires MSCDEX on the workstations, but it also installs NLMs in the *NetWare* file server, although as mounted drives rather than mounted volumes. It was a dedicated cache on the server.

■ Redirectors require a separate PC (typically dedicated) as the CD-ROM server. The file server doubles as the CD-ROM server in the topology used by the *CorelDriver* and *SCSI Express* products.

■ CD-ROM drives are far slower than hard disk drives (access times of 300 to 1,000 milliseconds and 25 to 35 ms., respectively). The disk caching included in CD-ROM networking products improves speed and makes it practical for multiple users to share access to the drives. All products reviewed have caching, but with vastly different efficiencies. ■

SHARING CD-ROMS ON DOS-BASED LANS

If your company is running a DOS-based LAN such as *LANtastic* or *POWERlan*, or is planning to implement one, you may have everything you need to share a CD-ROM drive among networked users.

by M. Keith Thompson

Sometimes it isn't necessary to look beyond your own backyard for solutions to your networking needs. This is the case for many users who need to share their CD-ROM drives and already have a DOS-based LAN or plan to purchase one. Many DOS-based LANs include the ability to connect a CD-ROM drive to any of your client PCs and provide other users on the network with access to it. Other DOS-based LANs require the addition of a third-party product, such as Fresh Technology's *MAP Assist*; *MAP Assist* can also be used on network operating systems, such as *LAN Manager* and *NetWare*.

Unlike the CD-ROM networking solutions reviewed in the main article, a DOS-based LAN does not include built-in disk caching to increase throughput when multiple users are accessing CD-ROM drives. *MAP Assist* includes disk caching, but only in conventional memory. (The redirectors in the main review can use expanded or extended memory for caching, while the NLM-based products use the file server's operating-system memory.) But the built-in CD-ROM abilities of DOS-based LANs and *MAP Assist* can prove a viable alternative for small networks with limited CD-ROM needs.

As a general rule, if your LAN supports peer-to-peer resource sharing, it will allow you to add a CD-ROM drive to a networked PC and share the CD-ROM across the network. But there are exceptions to the rule, and if your vendor does not advertise CD-ROM support, you should check first. With products that offer CD-ROM support, you can have as many CD-ROM drives

distributed throughout the network as you like. A peer-to-peer network treats the computers on the network as equals; each PC can serve as an individual user's personal workstation while at the same time sharing its resources, just as a server does.

Network operating systems with built-in CD-ROM support include Artisoft's *LANtastic*, Exzel's *EasyNetwork*, Grapevine LAN Products' *GV LAN OS*, Invisible Software's *Invisible Ethernet NET/30*, and Performance Technology's *POWERlan*. US Sage's *MainLAN Ethernet* is one DOS-based LAN that doesn't have CD-ROM support specifically built-in. Neither does Hayes' *LANStep*.

ACCESSING CD-ROM DRIVES

Since DOS (up to Version 3.3) could not handle disk drives larger than 32MB, Microsoft took it upon itself to create a standard way to access CD-ROM drives by writing the Microsoft CD-ROM Extensions (MSCDEX). To maintain maximum compatibility, all of the DOS-based LANs with built-in CD-ROM support use MSCDEX for accessing the CD-ROM drives.

These network operating systems all share the CD-ROM drives similarly. Once MSCDEX loads and DOS assigns the CD-ROM a drive letter, you assign a network name to the drive. The other computers on the network execute the command necessary to use or attach themselves to a shared network resource. In this way, all computers on the network can simultaneously query the same CD-ROM drive.

The products in the main review offer a couple of advantages over DOS-based LAN products; for instance, they work faster than DOS-based products,

particularly with a large number of simultaneous accesses. The products we look at in the main article can use multiple megabytes of RAM to cache the data on the CD-ROMs and therefore provide much quicker access to the data. Another problem with using the built-in CD-ROM networking abilities of DOS-based LANs is the low reliability factor of using a computer running DOS to multitask: DOS is not a very stable environment and tends to crash frequently. When the computer acting as the CD-ROM server goes into the black hole, the rest of the users on the network lose their access to the CD-ROM.

With DOS-based LANs, you can start by attaching a CD-ROM drive to a networked PC and use the built-in networking abilities (when available) to share CD-ROM data. As the traffic increases, you can add one of the CD-ROM networking products in the main review to achieve maximum throughput.

A CD-ROM ASSISTANT

Fresh Technology's *MAP Assist* is a separate program that adds the ability to share client PCs' DOS storage devices to both *NetWare* and *NetBIOS* LANs. This product is not a network operating system, but it acts like a peer-to-peer LAN by not requiring the CD-ROM server to be a dedicated device. Since our last review of *MAP Assist* ("Networking CD-ROMs," February 27, 1990), Fresh Technology has made significant improvements to *MAP Assist*'s performance. *MAP Assist* now handles multiple simultaneous requests with adequate response time.

To use *MAP Assist*, you simply attach a CD-ROM drive to any networked computer and load the MAHOST program and MSCDEX. *MAP Assist*'s security features allow managers to target the drives to be shared and also the sharers. *MAP Assist* operates in two modes: as a dedicated or nondedicated server. The nondedicated mode uses as little as 7K of RAM or as much

CONTINUED

Sharing CD-ROMs on DOS-Based LANs

CONTINUES

as 45K. Only the computer with the CD-ROM attached to it requires MSCDEX. On *NetWare* LANs, the other computers on the network simply run a 9K client program that allows them to use *NetWare's* MAP command to assign the CD-ROM drive to a drive letter. *MAP Assist* also works with other local storage devices such as local hard disks and WORM and rewritable optical drives. *MAP Assist* works just as simply on *NetBIOS* LANs.

Attaching CD-ROM drives to DOS-based networks by using their built-in abilities or a product such as *MAP Assist* can be cost-effective. Although these products do not offer the performance benefits for large numbers of simultaneous users, they function well for up to about 20 users with frequent access.

EasyNetwork, Version 2.0

Exzel Corp., 2003 E. 5th St., #3, Tempe, AZ 85281-3064; 800-325-7334, 602-894-0795.

List Price: 30-user version, with two Ethernet cards, cable, \$599.

Requires: For workstation: 13K RAM. For server (nondedicated): 50K RAM.

CIRCLE 428 ON READER SERVICE CARD

GV LAN OS, Version 1.4

Grapevine LAN Products Inc., 8519 154th Ave. NE, Redmond, WA 98052; 206-869-2707.

List Price: Three-user version, \$395.

Requires: For workstation: 85K RAM. For server (nondedicated): 85K RAM.

CIRCLE 429 ON READER SERVICE CARD

Invisible Ethernet NET/30, Version 2.21

Invisible Software Inc., 1142 Chess Dr., Foster City, CA 94404; 415-570-5967.

List Price: Each user, including network adapter, \$349.

Requires: For workstation: 60K RAM. For server (nondedicated): 85K RAM.

CIRCLE 542 ON READER SERVICE CARD

LANstep, Version 1.0

Hayes Microcomputer Products Inc., P.O. Box 105203, Atlanta, GA 30348; 404-441-1617.

List Price: Five-node starter kit, \$595; each step expander, \$395.

Requires: For workstation: 1MB extended memory. For server (nondedicated): 1.5MB extended memory.

CIRCLE 543 ON READER SERVICE CARD

LANTastic, Version 4.0

Artisoft Inc., 575 E. River Rd., Tucson, AZ 85704; 602-293-6363.

List Price: Two-node starter kit including two Ethernet adapters, \$699.

Requires: For workstation: 27K RAM. For server (nondedicated): 50K RAM.

CIRCLE 544 ON READER SERVICE CARD

MainLAN Ethernet, Version 3.3

US Sage Inc., 1215 N. Hwy. 427, #135, Longwood, FL 32750; 800-999-6770, 407-331-4400.

List Price: Ethernet starter kit with two 8-bit Ethernet cards, software for unlimited users, cabling, terminators, \$525. 8-bit Ethernet card, \$199.

Requires: For workstation: 32K RAM. For server (nondedicated): 55K RAM.

CIRCLE 545 ON READER SERVICE CARD

MAP Assist, Version 3.0

Fresh Technology Co., 1478 N. Tech Blvd., #101, Gilbert, AZ 85234; 800-554-2170, 602-497-4200.

List Price: Each file server with unlimited users, \$349.

Requires: For workstation: 9K RAM. For server (dedicated or nondedicated, for up to 100 people with 26 drives): 7K to 45K RAM.

CIRCLE 546 ON READER SERVICE CARD

POWERlan, Version 2.11

Performance Technology Inc., 800 Lincoln Center, 7800 IH-10 West, San Antonio, TX 78230; 800-327-8526, 512-349-2000.

List Price: Five-user license, \$795.

Requires: For workstation: 12.5K RAM. For server: (nondedicated) 11.2K RAM; (dedicated) 64K RAM with expanded memory to 32MB.

CIRCLE 547 ON READER SERVICE CARD

tary-interface CD-ROM drives in addition to SCSI.

CD-ROM'S POPULARITY

A recent technological boom has made it easier and more cost-effective than ever for any company that publishes printed material to publish on CD-ROM as well. CD-ROM titles typically cost vendors less than \$10 per disk to produce. With such products as Grolier Electronic Publishing's *The New Electronic Encyclopedia* and Microsoft *Bookshelf*, today's list includes not only general and professional reference works but also technical reference manuals. A parts manufacturer, for instance, may publish its catalog on CD-ROM to permit easy searching with a retrieval program. Developers of retrieval software include Online Computer Systems, makers of *Opti-Net* and *KnowledgeSet*. Many PC vendors, such as Autodesk, IBM, and Novell, already publish product reference manuals on CD.

Today, CD-ROM drive access times are in the 300- to 1,000-millisecond range ("CD-ROM Drives: Finally Up to Speed," October 29, 1991). Most hard disks, by contrast, boast speeds of 15 to 25 ms., while floppy-disk access times are a couple of hundred milliseconds. But a CD-ROM drive run on a network can benefit from the CD-ROM network product's disk cache; the resulting speeds, while still slower than those of other media, do make it practical for you to share your CD-ROM drives among multiple simultaneous users. The sequential throughput time of one user accessing a standalone Sony 1172 CD-ROM drive is 150 kilobytes per second; compare that with the 263-KBps sequential throughput rate achieved by the top-performing network CD-ROM solution (with one workstation accessing one drive).

Early developers of CD-ROM technology needed to overcome DOS's limitations, which included its inability to recognize any storage device larger than 32MB. The answer came in the form of the MS-DOS CD-ROM Extensions (MSCDEX), the DOS drivers that allow users to access standalone or networked CD-ROM drives as they would a hard or floppy disk. MSCDEX is required on the workstation in order for certain CD-ROM networking products, such as *CorelDriver* and *Opti-Net*, to establish a connection. MSCDEX typically requires about 19K in the workstation, plus about 8K for every networked CD-ROM drive that will be

Food for the senses at a price that makes sense: \$749*

Introducing CD Gallery™: The Interactive CD-ROM System from NEC.

Is this the offer you've been hungry for? Cash in big on the sensational world of CD-ROM with seven exciting software titles for the IBM PC and 100% compatibles, with all the necessary hardware including the amazing NEC CDR-36 CD-ROM reader, KOSS® SA/30 amplified stereo speakers and even stereo headphones, all for just \$749*. There's also a CD Gallery version available for the Macintosh at just \$699*. Or, if you want to upgrade to the NEC CDR-73, one of the fastest readers on the market, it's just \$1,050* for the IBM XT/AT. And it's all incredibly easy to set up and use. But don't chew on this offer too long because supplies are limited. Call 1-800-NEC-INFO for the nearest authorized NEC dealer to find out where you can pick up the ultimate feast for your mind.

*Manufacturer's suggested retail price, actual price may vary, call your dealer for actual pricing. Other versions available for PS-2, parallel SCSI & Macintosh. © 1991 NEC Technologies, Inc. CD Gallery is a trademark of NEC Technologies, Inc. The New Grolier Electronic Encyclopedia is a trademark of Grolier Incorporated. The Software Toolworks is a registered trademark of The Software Toolworks, Inc. Time Table of History is a trademark of Xiphos, Inc. Battle Chess is a trademark of InterPlay Productions. Macintosh is a registered trademark of Apple Computer, Inc. IBM XT, AT and PS-2 are registered trademarks of the International Business Machines Corp.

The New Grolier Electronic Encyclopedia™/
The Time Table of History™: Science and
Innovation/The Software Toolworks®
World Atlas/The TIME Almanac/Battle
Chess™/Great Cities of the World/National
Geographic Mammals: A Multimedia
Encyclopedia.

INTERACTIVE
CD-ROM DISCS

MultiSync 4FB

Because  is the way you want to go.

NEC

C&C Computers and Communications

CIRCLE 217 ON READER SERVICE CARD



A CD-ROM NETWORKING TOPOLOGY

There are a variety of ways to network CD-ROM drives. Here's an overview of the three ways to provide your network users with simultaneous access to CD-ROM resources.

The products reviewed here employ a mix of methods for networking CD-ROM drives. In the simpler scheme of pure redirector software (such as CBIS's *CD Connection*, Version 2.20C; Meridian Data's *CD Net*, Version 4.11; and Online Computer Systems' *Opti-Net*, DOS Version 1.3), one or more networked workstations connect indirectly through a concentrator or MAU (if either is present on the network) to a station designated as the CD-ROM server. This 286-or-better PC must be dedicated when using the CBIS or the Meridian product, but it is generally a good idea to do this with any of these products.

Both CBIS and Meridian market tower PC models that can each accommodate several CD-ROM drives and act as the CD-ROM server. (We also survey those offerings in the main review.) You can install one or more SCSI interface cards in whatever PC you use. In these configura-

tions, the SCSI cards can support up to seven CD-ROM drives. Proprietary interface cards, supported only by *CD Net*, will allow different numbers of daisy-chained drives.

MORE ON REDIRECTORS

The redirectors require that some software, particularly MS-DOS CD-ROM Extensions (MSCDEX) or the equivalent, be run on the individual workstations and on device drivers. With these products, the software on the workstation works together with the IPX (or NetBIOS) routing on the CD-ROM server to redirect the workstation's request for CD-ROM data over the network to the CD-ROM server. The CD-ROM server acknowledges the request from the workstation and allows access to the CD-ROM that can supply the requested information; using IPX (on *NetWare* networks), the CD-ROM server transmits that information back to the requesting workstation.

USING NLM-BASED PRODUCTS

The other method, employed in different ways by Corel Systems Corp. and Micro Design International, uses the file server itself as the CD-ROM server, rather than a separate PC. The server software, loaded as NLMs on *NetWare* 3.x, controls the sending of data from the CD-ROM drives

and monitors user access to CD-ROM applications.

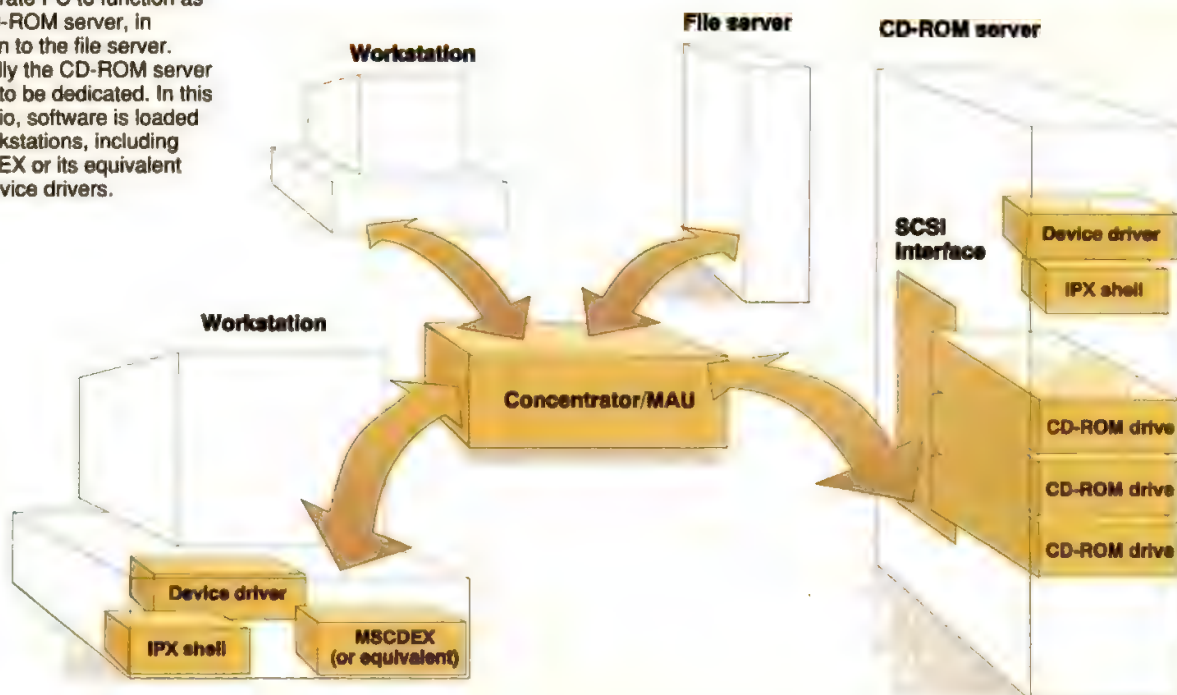
Unlike *CorelDriver*, *SCSI Express* allows workstations to access CD-ROMs by making the CD-ROM drives mounted volumes. Any workstation attached to the network/CD-ROM server can then use Novell's drive-mapping scheme to map a logical drive letter to each CD-ROM volume, thereby accessing the drives.

CorelDriver does not mount the CD-ROM drive as a volume, but rather creates on the file server a database containing information on each CD-ROM. Corel's workstation software drivers and MSCDEX are necessary for the workstation to gain access to the shared CD-ROM drive; *CorelDriver* can't take advantage of *NetWare*'s drive-mapping capability as can *SCSI Express*, Version 1.07 level A. *CorelDriver* instead relies on its own mapping utility. Corel's NLMs, installed on the file server, allow the request to be interpreted by the server network operating system and provide the workstation access to the CD-ROM drive.

NLM-based products also permit the integration of non-CD-ROM SCSI devices with the same interface card used to connect CD-ROM drives. Devices that can be daisy-chained include WORM drives, magneto-optical drives, and SCSI hard disks.

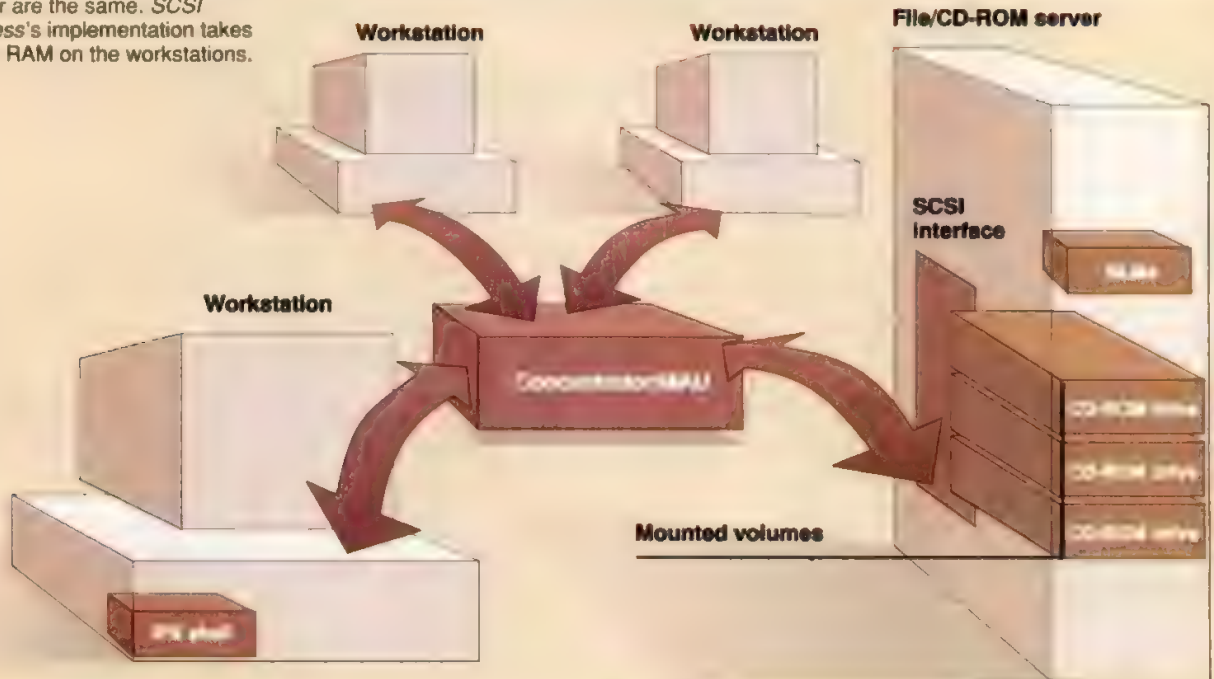
REDIRECTOR CD-ROM NETWORKING

Redirector software requires a separate PC to function as the CD-ROM server, in addition to the file server. Typically the CD-ROM server needs to be dedicated. In this scenario, software is loaded on workstations, including MSCDEX or its equivalent and device drivers.



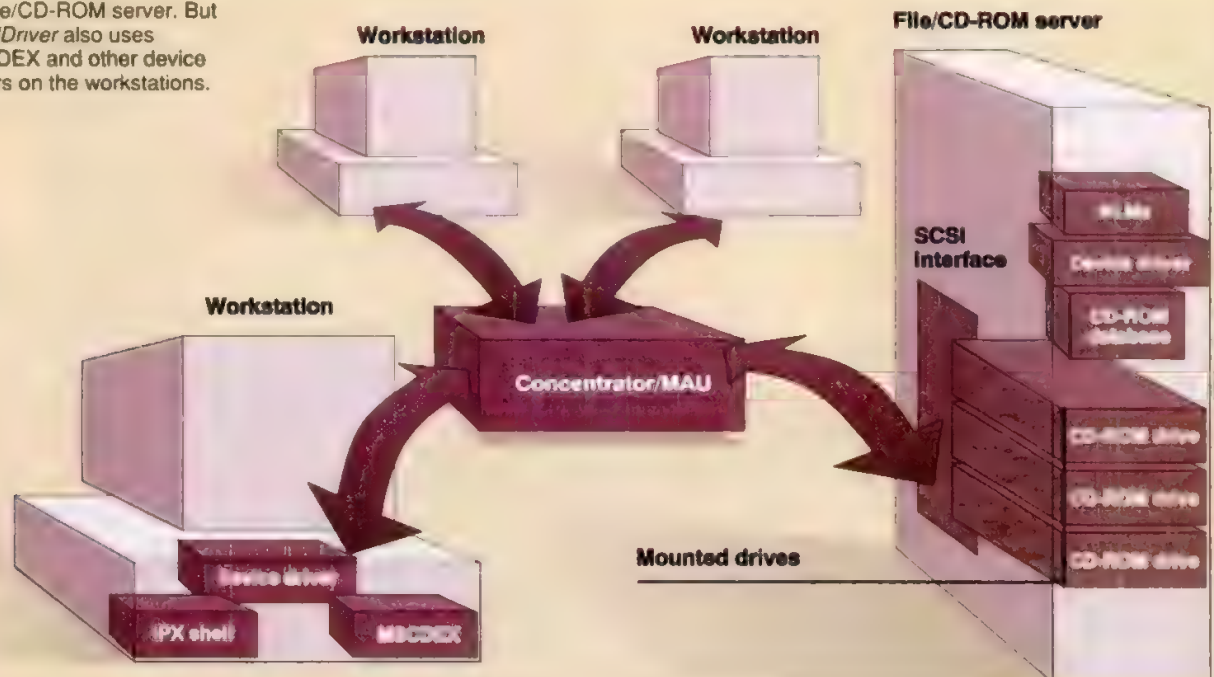
NLM-BASED CD-ROM NETWORKING SOLUTION: *SCSI Express*

With products that use NLMs, the file server and CD-ROM server are the same. *SCSI Express*'s implementation takes up no RAM on the workstations.



NLM-BASED CD-ROM NETWORKING SOLUTION: *CorelDriver*

Like *SCSI Express*, *CorelDriver* installs NLMs on the file/CD-ROM server. But *CorelDriver* also uses MSCDEX and other device drivers on the workstations.



accessed by that same workstation.

CD Connection and *CD Net* each contain some capability for establishing a connection and, depending on the application, may or may not need MSCDEX. MDI's *SCSI Express* avoids the requirement altogether by loading CD-ROM drive information into RAM to create a *NetWare* volume.

In a network that uses a pure redirector product, the redirector, MSCDEX, or equivalent software provided by the vendor works to redirect a workstation's request for CD-ROM data over the network to the appropriate drive. *CD Connection*, *CD Net*, and *Opti-Net* are redirectors. Also required for this approach are drivers for the specific network or NetBIOS, and the utility software that allows servers to pick drives, assign drive letters, and perform other tasks. For the most part, redirectors represent a fine choice for small networks with light CD-ROM use. In some cases, a reseller may be able to configure the products for heavy corporate or multisite university use.

The redirectors will not use your network's file server as the CD-ROM server, but instead require one or more PCs on the network to assume that role. *CD Connection* and *CD Net* must run on a dedicated CD-ROM server and may necessitate the purchase of an additional PC and accompanying hardware. But in practice, you will more likely want to dedicate a CD-ROM server to the task with any of the redirectors.

REDIRECTORS VS. NLMS

PC Labs's tests singled out two of the redirectors—CBIS's and Online's—as having difficulty with simultaneous random access from our five test-bed workstations and drives. This was the case for CBIS's software-only product and especially for its CD-ROM server/software combination. CBIS says its upcoming *NetWare* Loadable Module (NLM) and value-added process (VAP) versions for *NetWare* will address the caching bottleneck problems. The same is true for Online, whose current VAP version would not run on our *NetWare 386* test-bed configuration. To improve product performance, both vendors are revising the current versions.

Notably, Meridian Data's *CD Net* sped through our set of performance tests without error. It was probably the only product among the group of redirectors that could really give the rival NLM-based

SCSI Express a run for its money.

Redirectors have the advantage of compatibility with a number of network operating systems, especially NetBIOS-compatible LANs. Products like the NLM-based versions of *CorelDriver* and *SCSI Express* we reviewed are specifically

designed for *NetWare 386*.

SCSI Express is an NLM product that creates a volume of CD-ROM drive information on the file server and uses the standard caching pool as needed. The cost? At least 5MB of RAM on the server for optimum performance with five drives attached, but none whatsoever on the workstations (though the more RAM



EDITORS' CHOICE

- *CD Net*
- *SCSI Express*

If you want to get the most from networking your CD-ROM drives, Meridian Data and Micro Design International offer the products to do it. Meridian Data's *CD Net*, Version 4.11, and MDI's *SCSI Express*, Version 1.07 level A, provide the performance, simplicity, and features that make sharing networked CD-ROM drives easy and efficient.

CD Net is second only to *SCSI Express* in performance. When tested on our standard test-bed, *CD Net* boasted excellent throughput scores. Non-Novell users will like the fact that this redirector has built-in compatibility across a range of networks, from *NetWare* to *LAN Manager* to *LANtastic*, in a single package costing \$500 for two of these workstations.

Among the product's attractive features are utilities that simplify the process of setting up users for CD-ROM networking and at the same time offer network administrators an exemplary level of control over access rights. *CD Net* also gives users the welcome choice of selecting CD-ROMs via the DOS command line or a menu. While its performance on our standard test-bed leads us to give our Editors' Choice recommendation to Meridian Data's software alone, users who need a CD-ROM server may appreciate the one-stop shopping provided by the company's *CD Net Model 314*. This well-organized system, combined with *CD Net*, offers good performance and useful features,

including a locking front panel for security.

ANOTHER WINNER

If you're a *NetWare 3.x* user, *SCSI Express* offers maximum throughput with minimum fuss. At \$795 per network for the software-only version we tested, this was one of the lowest-priced products we reviewed. The company offers versions for a range of network operating systems, but it was the *NetWare*-specific version we saw that impressed us with the fastest throughput times of the products reviewed. *SCSI Express* accomplishes this feat by being tightly integrated with the network operating system; it installs on the file server as NLMs and therefore uses *NetWare*'s caching capabilities to the fullest.

Installing *SCSI Express* is as simple as copying files to the server's hard disk; using the software is barely more difficult. If you don't use CD-ROM applications that require MSCDEX, you will appreciate the product's departure from the redirector approach to CD-ROM networking, and especially the fact that it takes up no memory on user workstations. Also in its favor: Unlike most of the other products, *SCSI Express* supports a variety of SCSI devices in addition to CD-ROMs, including WORMs, rewritable optical drives, and tape backup drives.

The Only Clean Windows Solution On Networks Is Invisible.

If you're hunting for a peer-to-peer network that's fast, affordable and works with Windows, take a hard look at Invisible. Our NET/30™ for Windows cleanly integrates today's two most productive technologies: DOS-based networking and Microsoft® Windows 3.0.

With this powerful, highly visual package, your workgroups can economically and efficiently share resources — equipment, programs and data. From one station, you can easily run multiple applications as if they were on stand-alone machines. Which puts the multi-tasking capabilities of today's advanced computers to work in your business.

NET/30 for Windows gives you the power network features you expect, including security protection,

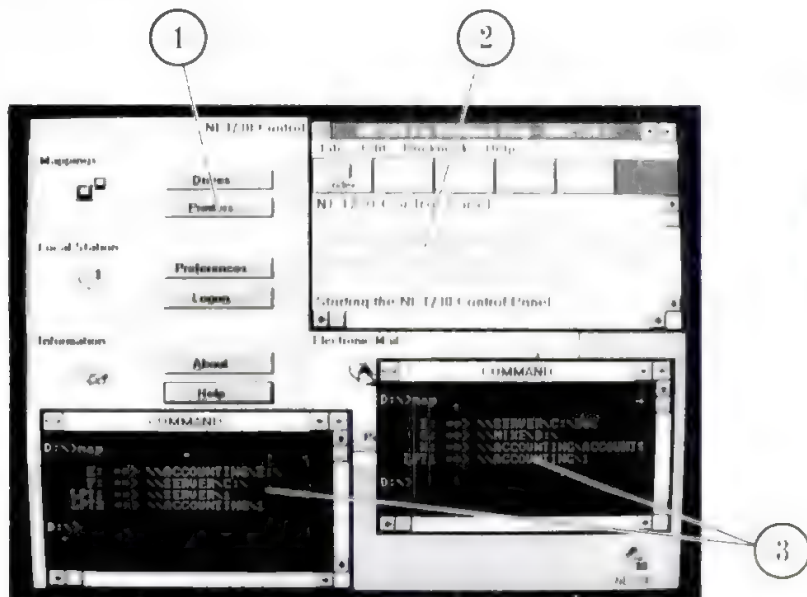
graphical interface, on-line help, electronic mail, high-speed database access, and support for standard Windows utilities.

Now you can do Windows anywhere on your network. With NET/30 for Windows. For information call (415) 570-5967. Or write: Invisible Software, Inc., 1142 Chess Drive, Foster City, CA 94404.

Microsoft Windows is a registered trademark of Microsoft Corporation. NET/30 for Windows is a trademark of Invisible Software, Inc.

INVISIBLE

S O F T W A R E



1. NET/30 Control Panel lets you take complete charge of the network. It exploits the Windows graphical interface to make network management a breeze. Access network disks and printers. View print queues. Control security. Monitor use of server resources. Send and receive electronic mail.

2. NET/30 Help System includes context-sensitive help plus a complete on-line reference manual. Hypertext lets you quickly find what you need.

3. This example shows how each DOS window can access a different set of network disks and printers. With NET/30, each DOS window is a separate network station. Run multi-user applications in several DOS windows while sharing data and resources. It's just like running on separate computers.

CIRCLE 228 ON READER SERVICE CARD



available for caching, the better performance you will see). The result? By far the greatest throughput among all the products reviewed.

With all of these products, the disk caching involved during CD-ROM networking should inherently permit greater speeds than you will get from a non-networked CD-ROM drive attached to a standalone PC. But only *SCSI Express* consistently demonstrates this advantage. Even with four stations accessing four of our test-bed Sony 7211 drives, *SCSI Express* permitted greater throughput than a Sony CDU-7211 acting as a standalone device using only MSCDEX. This shows that it's not just the disk caching that is important; the disk caching also must be properly implemented.

If server RAM is a consideration, a midpoint between *SCSI Express* and the redirectors is *CorelDriver*, from the makers of the popular *CorelDRAW*. This *NetWare 386* NLM product does not create a *NetWare* volume, so it uses less RAM than *SCSI Express*; you will need only a little over 2MB with five drives connected, or as little as 250K without caching. You do lose workstation RAM—35K for five drives without MSCDEX loaded into expanded memory (not including up to 30 2K buffers).

Compare this with the redirectors. You need 4K to 7K RAM plus more for MSCDEX on the workstation to run *OptiNet's* TSR. *CD Connection* uses 20 to 22K on the Novell-version workstation, although you can reduce this to 650 bytes if you load the rest into expanded memory. The reviewed *NetWare* version of *CD Net* requires 12K for its driver (7K in the NetBIOS version) and some initial RAM that doesn't stay resident when you run its mounting and menuing utilities.

Both NLM products take advantage of their integration with *NetWare*, which can monitor workstation usage of any NLM loaded into the server. One additional benefit enjoyed by *SCSI Express* alone is directory hashing, which makes searching the cache more efficient. *CorelDriver* does not yet include this type of feature because its cache is dedicated and cannot be released for other uses.

Another advantage of MDI's product is elevator seeking, by which the network can select a drive whose read head is closest to the data requested from among several CD-ROM drives containing the same disks. CBIS's offering also supports this but calls the feature disk mirroring.

REVIEW CRITERIA

To be included in our review, each product had to run on *NetWare 386* through either IPX/SPX or NetBIOS. The redirectors had to be able to provide disk caching in expanded or extended memory on the CD-ROM server; the NLM-based products take advantage of the file server's

The sharing of CD technology is itself a good reason to establish a network. Some CD-ROM products are sold bundled with LAN packages.

network operating system memory for their disk caching. Each product also had to support the High Sierra standard, which is supported by the Sony CDU-7211 SCSI II CD-ROM drive we chose for use in our standard test-bed. (The Sony is expensive, but it provides optimum performance.) The product had to work with either the Future Domain interface card sold with the Sony drive or one of Adaptec's 15, 16, or 17 series of host adapters.

Several otherwise worthwhile products did not fit into these specifications. Among these are complete DOS-based LANs or third-party add-ons that include networked CD-ROM support. For our survey of Artisoft's *LANtastic*, Fresh Technology's *MAP Assist*, and others, see the sidebar "Sharing CD-ROMs on DOS-Based LANs."

HOW TO CHOOSE

The sharing of CD-ROM technology is itself a good reason to establish a network. If you're in the mere planning stages of a LAN, some of the products reviewed can be sold bundled with a LAN package. For instance, CBIS's forte is actually its *NetWork-OS*, a DOS-based LAN, for which a version of *CD Connection* is available.

For readers with an existing LAN, your current configuration will serve as the best guide for which product is best for

you. With each choice comes a compromise, but the best of the products give you plenty in return.

The SCSI technology used by the CD-ROM adapters implies by definition that SCSI devices other than CD-ROM drives can run off the same server-installed adapter card. This is a cost savings, since one SCSI card can run up to seven devices. Indeed, MDI claims that *SCSI Express* supports any SCSI device whatsoever: SCSI hard disks, WORM (write once, read many) drives, magneto-optical and rewritable optical drives, and others.

As you might expect, it's not always as easy as that. For one thing, the redirectors reviewed are all specific to CD-ROM SCSI devices. For another, only the software layer between the card and the devices connected to it are well-defined by SCSI. Various vendors have tried to develop a standard, known as CAM (Common Access Method), that could be used to define the software layer between the operating system and the SCSI host adapter card. But many of the adapter vendors already had proprietary specifications that they wanted to assert as the true CAM, and this has resulted in the existence of multiple CAM specifications.

Introduced by Adaptec, ASPI (Advanced SCSI Programming Interface) is one potential standard of integrating SCSI devices that may yet win out over other CAM standards, such as the one embraced by Adaptec's competitor, Future Domain. ASPI fleshes out CAM into something with enough detail for developers to use in writing drivers. *CorelDriver's* universal version, for example, will support any SCSI device as long as the device supports ASPI. It is far too early to tell, but all vendors except Online have plans to allow full ASPI compatibility for users who require it. That doesn't mean, however, that they will shut out the CAM standards being pushed by other host adapter makers. Software vendors will just include a driver for ASPI, one for Future Domain's CAM, and ones for any other CAM standards that grow sufficiently in popularity.

Another important consideration in selecting a CD-ROM networking system is security. The *CD Connection* and *OptiNet* versions we tested, for instance, don't include features for setting rights. You need to take other measures to keep workstation users from tampering with databases in the drive or loading other disks into it. In some cases, you can rely on the network operating system's security. Both

JUKEBOX MINICHANGERS: Inexpensive Multiple-CD Access, but Not for Every Network

by Angela Gunn and
M. Keith Thompson

CD jukebox minichangers are more common in their audio incarnation than in network form, but the CD-ROM versions of these drives can provide good value on small LANs, where users need to share multiple disks.

To distinguish the CD-ROM devices from audio jukeboxes, vendors refer to them as industrial jukeboxes or minichangers. The *jukebox* moniker, for audio at least, is an apt one. Several CDs snap into slots in a cartridge known as a *magazine*; when a user wants to play a disk in one of the slots, the minichanger spins the CD into the drive. Many disks, one player, hands-free switching—not unlike the record machine at the back of the bar.

On the audio player, it takes only a few seconds for the changer to stop one CD, rotate it back into its slot, select another CD, and rotate it into position. In a second or two, the read head locates the appropriate, sequentially encoded track and starts reading. On the network, information retrieval is rarely so simple. It is extremely unlikely that the requested data will lie sequentially on a CD-ROM.

CD-ROM data access also remains significantly slower than access to other forms of data storage. Add to this slow access time the several seconds required for any changer mechanism to manipulate the disks, and the convenience of having six disks at the ready seems to evaporate quickly.

Nevertheless, six disks on one CD-ROM drive are cheaper than six disks on six CD-ROM drives. A CD-ROM drive that accommodates a single CD can cost between \$500 and \$1,000. Some offices may not be able to justify a six-drive investment. With a minichanger, they can avoid the annoyance and risk of constantly shuffling around expensive CD-ROMs. Other offices may have a multidisk database that, while rarely used, must remain readily available at all times.

To weigh convenience and price against performance, we hooked the

Pioneer DRM-600 CD-ROM Minichanger into a *NetWare* network. The Pioneer DRM-600 sells for \$1,295, plus an additional \$100 for a SCSI interface kit. Pioneer Communications of America is the sole manufacturer of industrial CD-ROM jukeboxes and markets them to other companies and distributors. Its DRM-600 is a compact and sturdy six-slot drive with an audio jack at the front. Though the caddy for the Pioneer CD-ROM data minichanger is interchangeable with that company's audio jukebox, the data minichanger is much sturdier (and wired for hookup to a computer, not a receiver). While the audio division of Pioneer has some competition in its field, in connectivity the company stands alone.

Of the software packages reviewed in the main article, Online Computer Systems's *Opti-Net*, DOS Version 1.3; Micro Design International's *SCSI Express*, Version 1.07 level A; and the software for Corel's CorelDriver Optical Disk Interface Kit presently support CD-ROM minichangers. We performed our tests using the CorelDriver Kit software/Adaptec board combination.

A PIONEER ON THE NETWORK

Installation was similar to that for a single CD-ROM drive. Once installed, with one user on the network accessing all the drives, the DRM-600 gave us access times that were roughly in line with standalone CD-ROM speeds. To end users, operation was transparent.

On a LAN, 6, 12, or 20 people might want access to those drives, however. With multiple access demands, the minichanger can work as well as any other CD-ROM configuration, but under certain high-usage circumstances, critical collisions can occur.

The likelihood of user collision on the minichanger depends on the search software and the location of the various users in the search process. If several users request data from a single CD-ROM, access is unfailingly permitted. Similarly, if multiple users are

reading information from more than one CD-ROM but only one is actually using the search function at one time, there is no problem.

But woe unto users attempting to search simultaneously on separate disks. The CD-ROM, attempting to please everybody, first reads a portion on one search, then a portion of another. Meanwhile, both searches slow down; in some cases, it takes up to 10 minutes to complete the search. Many programs, such as *Computer Select*, will simply quit the session or freeze up after such a long period of inactivity. Meanwhile, users' computers are effectively on vacation. Short of scheduling CD-ROM time for each user on an informal basis in these situations or sending a message over the network to warn others that you will be accessing a drive, there is no way of averting these collisions beforehand.

You can see that the DRM-600 isn't appropriate for large, heavily trafficked LAN installations. Yet users in many other types of networks will likely be happy with a minichanger. Companies with little-used but vital information on multiple CD-ROM disks can ensure constant access for network users without tying up precious drives and expensive read heads. And small outfits can gain the benefits of multiple CD-ROM drives cheaply. For those networks with limited but definite CD-ROM needs, the minichanger is worth a look. ■

Pioneer DRM-600 CD-ROM Minichanger

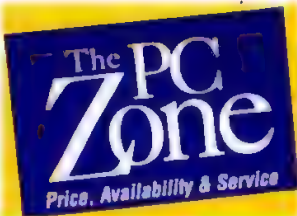
Pioneer Communications of America Inc., 600 E. Crescent Ave., Upper Saddle River, NJ 07458; 800-527-3766, 201-327-6400.

List Price: One drive with six CD-ROM slots and IBM PC software, \$1,295. DRM-PC interface kit (including Future Domain TMC-845 SCSI card, cable, and manuals), \$100. DRM-PS-2 interface kit (including SCSI card, cable, and manuals), \$300.

Requires: CD-ROM LAN software.

CIRCLE 548 ON READER SERVICE CARD

OPEN 24 HOURS • 1-800-258-8088 • USA & CANADA



Our commitment:

- Consistent low pricing
- Knowledgeable Sales Advisors
- Quality products and latest versions
- Over 1500 products in stock
- Open 24 hours: Order between 9pm to 7am Eastern Time and shipping is free in USA
- Hassle-free ordering and *6 overnight delivery by Airborne Express

Now! You can place your PC Zone order through

CompuServe

Just Type:

Go MZ

Multiple Zones International

NOW! Our Canadian customers' orders, in most cases, delivered within 24 hours. By special arrangement with Canadian Customs all applicable duties and GST taxes will be charged when placing your order with the Zone. Your products can now be delivered hassle free through Customs without delay. Shipping charges as low as \$16 (US) via Airborne Express. Call for complete information.



FREE!
Z-Nix Super Mouse II

Microsoft Windows 3.0 + Super Mouse II \$88

Microsoft Windows graphical environment Version 3.0 gives you the ability to work with all your applications within an exciting visual environment. It's what personal computing is meant to be! You also get absolutely free Z-Nix Super Mouse II.

PRINTERS

Ablon Technology Corp	
LaserScript Lx	1745
Bezier Systems	
Bp4040 Postscript Laser ..	1499
Canon	
Auto Sheet Feeder B1 10E	89
BJ 10Ex Bub.Jet Prter Bk	328
Costar	
Address Writer	479
Hewlett Packard	
Deskjet 500 Printer For PC ..	548
Laserjet IIP Laser Printer	994

Jetfill	
Ink Cart Refill Blue	19
Ink Cart Refill Brown	19
Ink Cart Refill Red	19
Ink Cart Refill Green	19
Ink Cart Refill (2Pak)HP Ink ..	19
Metro Software	
Laserwin For Canon Lbp	111
Microtek	
True Laser Printer	1399
Texas Instruments	
TI PS 17 Laser Printer	1300
TT PS 35 Laser Printer	1699

Application Techniques Pizazz Plus



\$64



PictureEze \$94

PictureEze was created to improve your computer images for desktop publishing, get professional

printing results and color adjustments and resolve hardware

incompatibility. Use Pizazz Plus, the graphics file converter, for easy access to more graphic images; conversion for specific applications, superior image modifications and flexible color enhancements.

HARD DRIVES

Cal Abco/Syquest	
44Meg Internal Kit	569
Iomega Bernoulli	
44 Meg Cartridge (3)	249
44 Meg Internal Rem	699
8244X 44Meg Ext	1894
II Transportable 44	915
NEC Home Electronics	
CD ROM SCSI Intfc Ps/2	199
CDR 73 w/GenRefCdGr7X1 ..	849
CDR 83 Xt InterCDROM Drv 730	
CDR 36 CDROMw/PC Adptr 449	
CDR 36 w/General Ref	579
CDR 83 Inter. CD ROM Drv ..	545

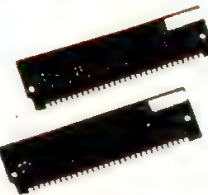
Plus Development	
Hardcard II XL105Meg9MS 589	
Hardcard II XL 50Meg 9MS 389	
Impulse 42Mb IDE Int HD	329
Impulse 84Mb IDE Int HD	529
Seagate	
HD 40 Mb Int IDE	269
SyDOS	
44E Rem HD External Kit	759
44I Rem HD Internal Kit	629
88E Rem HD External Kit	999
88I Rem HD Internal Kit	949
Teac	
Teac 1.4M 3.5 Flpy Dr.PC	64

INPUT DEVICES

Appoint	
Mouse Pen Professional	64
Digital Vision	
Computer Eyes Color	329
Kensington	
Expert Mouse Ser.	95
Logitech	
Cordless Radio Mouseman ..	109
Scanman Model 32 PC	164
Mouseman Bus R.Hand PC ..	70
MousemanSer.w/Wndws3 ..	119
Scanman 256 For Wndws ..	298
Trackman Port. Trackball	109
Marstek/Colorartist	
Color Hand Scanner	495
Micro Touch Systems	
Unmouse For The PC	159
Microsoft Corporation	
Ballpoint Mouse	118
Serial Mouse (And PS/2)	86
Ser. Mouse W/ Wndws 3.0 ..	144
Microspeed Inc.	
PC Trackball Serial	69
Microtek/Scanmaker	
600Z (Color/Gray)	1515
Mouse Systems Corp	
Omni Mouse II Bus Ver.	59
PC Mouse III Serial w/Trip	82
Nisca Scanners	
Niscan/Gs For Windows	239

MicroTouch UnMouse \$159

This intuitive touch tablet lets you work both productively and creatively. Just slide your finger over the glass and press to click. It's the fastest device around, especially in absolute mode, with one million touch points mapping precisely to the screen! Or pick up the stylus and draw freehand using the UnMouse as a mini-graphics tablet.



**1 Mb SIMMs
1 x 9 x 80ns**

\$58

Between MS-DOS 5, Windows, and all the other hot new programs on the market today, memory can quickly become a scarce resource. At this low price, now's the time to increase the memory capacity of your computer.

MONITORS & VIDEO BOARDS

ATI		Paradise	
VGA Wndr+ 512Kw/Mouse ..	225	Fantasy VGA 16BitCol 256K ..	125
Everax Systems/Eversync		Paradise Basic VGA Card	129
300 VGA Color Mon.	499	Polaroid/Polar Filter	
Keypoint, Inc./Viewsonic		CP 50 607012	35
4 Super VGA Monitor	399	CP 50 607327	35
5 Super VGA Monitor	649	CP 50 607328	35
Perfectview VGA Card	165	CP 50 608756	35
NEC Home Electronics		CP 50 611364	35
Graphics Engine 256 VGA ..	968	CP 50Sc 611584	45
Multisync 4d VGA Montr ..	1049	CP 50Sc 611585	45
Multisync 3ds VGA Montr ..	670	CP 50Sc 611586	45
Multisync 5d 20 VGA Mntr 2334		CP 50Sc 611587	45
		CP 50Sc 611589	45
		CP 50Sc 611590	45
		CP Workstation 614957	159
		Sigma Designs	
		VGA Legend Card 512K	219
		VGA Legend Card 1024K	259



Intuitive Touch!

MODEMS & FAXES

Cardinal		Practical Peripherals	
1200 Baud Int. Modem	64	Modem 1200 Internal	63
2400 Baud Ext Modem	89	Modem 1200Sa Mini	74
2400 Baud Int Modem	78	Modem 2400 Internal	128
2400 Int W/ Sendfax	115	Modem 2400 Ps/2	230
2400Mnp Ext Modem	165	Modem 2400 V.42Bis	195
2400Mnp Int Modem	158	Modem 2400Sa	178
9600V.42Bis Ext Modem	459	Modem 2400Sa V.42Bis	215
Modem V.42 2400Baud	175	Modem 9600 Sa	488
Computer Peripherals/Viva		Pocket Modem 2400	124
2400 Baud External Modem ..	99	Prometheus/Promodem	
		24/96Bsr Fax Modem	169
		24/96Sr Fax+Mirror II	259
		9600+ Ext. Modem	630
		Ultima 14.4 Modem	699
		Relisys	
		Relisys Tefax For PC	869
		The Complete PC	
		The Complete Fax 9600	288
		U.S. Robotics	
		Courier HST 14.4 IntMod.	598
		Courier HST Std V.42	995
		Courier HST Std V.42	675
		Courier V.32 9600 ExtMod. 674	
		Sportster V.32 9600IntMod.439	
		Zoom Telephonics/Modem	
		Fmc9624 24/96 Srfax	135
		Hst 14.4 Modem Ext	624
		Hc2400R Int	75
		Hcs196 Int 96 Sfax	95
		Mx2400R External	99
		Mxs196 Ext 96 Sfax	105
		V42X 2400 V.42 Ext	195

Microsoft MS-DOS 5 Upgrade



Microsoft MS-DOS 5 Upgrade

\$59

When you install this operating system upgrade on any PC with an 80286 or higher processor, you automatically give your applications more room in which to work. If you have one or a thousand computers to upgrade, MS-DOS 5 is the best choice for convenience, security and reliability.

Call for our Complete Product Listings

We carry over 1600 PC Products

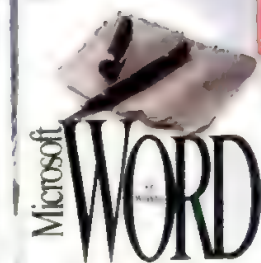


OVERNIGHT SHIPPING • 1-800-258-8088 • \$6 PER ORDER IN U.S.A.

NEW!

Microsoft Word 2.0 for Windows

Call for Price



Microsoft Word for Windows, the leading word processor designed for Windows, makes everyday work easy. Create tables, bullets, charts, columns and drawings. They're all just a click away with the Toolbar. You can create envelopes or check your spelling with a mouse click, too.

WORD PROCESSORS

Lotus Corp	
Ami Pro 2.0	299
Ami Pro 2.0 Comp. Upgr.	99
Microsoft Corporation	
Word 5.5 for PC	205
Word for Windows 2.0	Call
Que	
Rightwriter 4.0	53
Reference Software	
Grammatik IV 2.0 for PC	59
Grammatik Windows 2.0	59
Software Publishing	
Professional Write 2.2	159
Professional Write Plus	168
Solution Systems	
Brief 3.1 For DOS	185
Stairway Software	
Screen Extender For W.P.	65
Symantec	
Justright V1.0 for Wndws ...	135
Systems Compatibility	
Complete Writers Toolkit	79
The Software Toolworks	
Word for Word/Windows	44
WordPerfect Corporation	
LetterPerfect 1.0	125
WordPerfect 5.1 20 Pack	3300
WordPerfect 5.1 5 Pack	1100
WordPerfect 5.1	239
WordPerfect 5.1 for Wndws	289
WordPerfect Office 3.0	85
Writing Tools Group, Inc.	
Correct Grammar for Wndws ..	58



Lotus Double-Up Bundle

\$158 for both

SAVE UP TO \$300!
Upgrade to BOTH programs if you own an earlier version of either!

1-2-3: the spreadsheet that takes complete advantage of Windows. Pull-down menus and dialog boxes. Compatible with all 1-2-3 files, styles and macros. AmiPro: the visual word processor you'll use for even the most sophisticated documents. Tools include outlining, tables, drawing, equations, a full macro language and more.

GENERAL BUSINESS

Auto Map Inc.		Lotus Corp	
Automap Road Atlas	51	Lotus 123 Rel 2.3	335
Avery Labels		Lotus 123 Rel 3.1+	418
Avery Labelpro For Lasers	47	Lotus 123/Windows	399
Bell Atlantic		Lotus Double Up Upgr.	158
Thinix	319	Microsoft Corporation	
Borland International		Excel 3.0 for Windows	309
Quattro Pro 3.0	329	Office 1.6 for Windows	484
Computer Associates		Nolo Press	
Super Calc 5.1	99	Willmaker 4.0 PC	33
Jian Tools		PC Globe, Inc.	
Biz Plan Builder	95	PC Globe 4.0	36

Fonts

Adobe Systems Inc.		Font 106 ITC Berkeley	239
Font 180 Adobe Caslon	177	Font 14 Helvetica Cond.	239
Type Set 1 For Windows	58	Font 20 Goudy Old Style	119
Type Set 2 For Windows	58	Font 39 Futura 1	177
Type Set 3 For Windows	118	Font 47 Futura Condensed ..	239
Type Mngr+Pk for Wndws	115	Font 6 Optima	119
Adobe Postscript Cartridge ..	299	Agfa	
Font 100 Adobe Garamond ..	177	Styles Unlimited	129
Font 101 Adobe Gara.Exp	119	Atech Software	

Graphics & CAD

Autodesk, Inc.		Publ.Powerpak for Wndws ...	44
Autosketch 3.0	145	Publ.Powerpak WordPerfect ..	44
Computer Support Corp.		Brown Wagh Publishing	
Arts&Ltrs Graphic Ed. 3.1 ..	365	More Fonts For Windows	74
Computereasy Software		ACCOUNTING	
Floor Plan	25	Computer Associates/Accpac	
Corel Systems		BPI Accounts Payable	232
Corel Draw 2.0	368	BPI Accounts Receivable	234
Design Cad, Inc.		BPI General Acctg 3.0	234
Design Cad 2D V5.0	182	DAC Software	
Design Cad 3D V 3.1	199	DAC Easy Payroll 4.1	52
Digital Research		Lucid 3D	55
Gem Artline V2.0	425	Great American Software	
Dynaware USA Inc		Onewriter + Acctg Sys 2.06 ..	165
Dynaperspective DOS	599	Hooper International	
Electronic Arts		Taking Care Bus. Start Kit ...	78
Deluxe Paint II (Enhanced) ...	79	Taking Care Bus. 8 Module ..	179
Foresight Resources		Intuit	
Dratix CAD for Windows	429	Quick Pay	34
Generic Software		M USA	
CAD 5.0	285	Pacioli 2000	32
CAD Auto Convert 5.0	58	Mega Ventures	
hDC Computer		Managing your Money 7.0 ..	129
Icon Designer	33	Microsoft Corporation	
Mathsoft		MS Money For Windows	49
Mathcad 3.0 for Windows	327	Peachtree Software	
Micrografix		Peachtree Complete III	139
Designer 3.1	459	Peachtree III Bonus Bundle ..	215
Software Publishing		Reality Technologies	
Harvard Geographics	265	Wealthbuilder 1.1	98
Z Soft		Wealthstarter 2.0	34
Publisher's Paintbrush	299	Timeslips	
Zenographics, Inc.		Timeslips III 4.0	188
Pixie 2.0	164	Wilson Windowware	
		Wincheck 3.0 For Windows ..	45

the Windows interface. You get WYSIWYG viewing of fonts and graphics as you work, the ability to cut, copy and paste between up to nine documents open at one time, and a host of other new features.



Borland Quattro Pro SE \$46

Paradox SE \$65

Special Edition of two high-end programs! Quattro Pro SE has the spreadsheet capacity to work quickly with large spreadsheets on PCs with minimum hardware configurations. Paradox SE is the relational database that includes Query By Example, integrated forms, reports and graphs, making it ideal for first-time database users.

PRESENTATION & FORMS

Aldus Corp.	
Persuasion 2.0 for Wndws ..	369
Ashton Tate	
Applause II 1.5	239
Banner Blue Software	
Family Tree Maker 1.0	44
Org Plus Advanced 6.0 PC ..	67
Delrina Technology/Perform	
Designer & Filler 2.1	98
Pro for Windows	146
Digital Composition	
Db Publish for Ventura 1.0 ..	148
Fox Software	
Fox Graph 1.0	173
Lotus Corp	
Freelance Graphics 4.0	329
Micrografix	
Charisma For Windows	339
Microsoft Corporation	
Powerpoint For Windows	315
New England Software	
Gb Stat 2.0	235
Graph In The Box Exec.	158
Patton & Patton Software	
Flow Charting III	138
Roykore	
ABC Flowcharter/Wndws	185

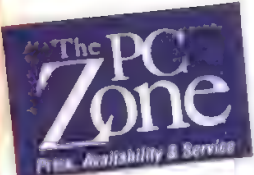
DATABASES

Borland International	
Paradox 3.5	519
Fox Software	
Fox Pro 2.0	458
Gensoft, Inc.	
dBlast Database for Wndws ..	285
Nantucket Corporation	
Clipper 5.0	509
Symantec	
Q&A 4.0	249

\$295
with FREE Adobe Type Cartridge 1 or 2—save up to \$230!

With this genuine PostScript interpreter from Adobe in your LaserJet II, you can make the most of your application software. Manipulate type, create flawless charts and graphs, build blends and shades—and get Adobe Type Cartridge 1 or 2 absolutely FREE!





Free Shipping on Orders
Placed between 9pm to 7am Eastern Time

**Roykore
ABC Flowcharter**

ABC Flowcharter is the flow diagram and organization chart program designed for high speed, graphics-based PCs. It has fast and easy drawing tools and object editing, flexible chart sizes, and extensive printer support.

\$125

**Instant
ORGcharting!**

\$185

Instant ORGcharting! automatically creates perfectly spaced and aligned charts. Includes automatic line and box connections, multiple fonts within a box, database import, picture and notes attached to boxes.

UTILITIES

Addstar Superstar V1.3 89	Win Sleuth 82	Insight Development Corp Print A Plot 2.0 188
Adobe Systems Type Align for Windows 68	Fifth Generation Direct Access 5.1 64	Landmark Systems Align It! Disk Cleaner 169
Type Mgr for Windows 58	Disk Lock 1.0 for PC 122	Kickstart 2 Diagnostic Bd 489
Application Techniques Pictureze 94	Fastback Plus 3.0 124	PC Probe Diagnostic Utility 99
Pizzazz Plus 84	Pyro 1.0 for PC 33	Service Diagnostics Kit 409
Berkley Systems Design After Dark For Windows 28	Gibson Research Spinrite II V2.0 68	LaserTools Printcache 2.4 95
Bitstream Inc. Face Lift 1.2 For Windows 58	hDC Computer First Apps for Windows 48	Lotus Corp Magellan 2.0 89
Central Point Software Copy II PC 6.0 24	Helix Netroom 2.0 Single User 48	Microcom Virex PC 75
Copy II PC Deluxe Option Bd 119	Netroom 4 User Pak 87	Multisoft PC Kwik Powerpak 2.1 70
Dariana Technologies System Sleuth Pro for PC 82	Icom Simulations Intermission 2.0 33	Super PC Kwik 4.0 45
	Insel Systems Hijaak 2.0 98	Prime Solutions Disk Technician Gold 92



**Polaris
PackRat**

\$249

This powerful, fully integrated information manager is designed to take full advantage of Windows.

PackRat makes it easy to manage all types of business and personal information which you can view and print in a variety of useful formats. You can easily customize it to meet your needs.

PIMS & MANAGEMENT

Craigh Computer Biz Base 2.1 Gold 224	Mb Allen Daily Plan It! 64	Polaris Software Packrat 3.0 for Windows 249
Biz Base 2.1 Personal 39	Merrill & Bryan Info Spotter 49	Power Up Address Book Plus for PC 59
Chronologic Corp. Instant Recall 1.2 61	Micrologic Info Select V2.0 103	Calendar Creator Plus V4.0 54
Chronos Software Who What When 2.0 169	Microsoft Corporation Project for Windows 449	Quick Schedule Plus for PC 63
Contact Software Int'l Act! 2.0 224	Okna Corporation The Desktop Set for Wndws 83	Top Priority 59
Lotus Corp Agenda 2.0 285		Symantec On Target V1.0 for Wndws 259

Aristosoft

**More
Windows**

\$65

A virtual screen enlarger for Windows. A screen utility that uses spare memory in VGA/EGA cards to give access to up to 300% more screen area.

**Wired for
Sound**

\$25

Multimedia for Windows, without adding hardware. Over 50 different sound effects, musical cues and voices through your PC speaker.



COMMUNICATIONS

Software Ventures Microphone II for Wndws 225	IV Host&Remote 89
Alien Computing Faxit! 119	Futuresoft Dynacomm 3.0 Async Ver. 190
cc:Mail cc:Mail 3.2 (25 User) 420	Hayes Smartcomm Exec 2.1 74
Expand (25 User Pack) 395	Hilgrave/Hyperaccess 5 2.0 DOS/OS/2 114
Compuserve Information Web Kit 19	Microcom Carbon Copy Autopilot 1.0 52
Crosstalk Communications Crosstalk Communicator 28	Carbon Copy Plus 6.0 114
Crosstalk for Wndws 1.2 122	Relay Gold 4.0 160
Crosstalk Mark IV 2.0 140	Prodigy Prodigy Start Up Kit for PC 26
Datastorm Technologies Procomm Plus 2.0 64	Softklone Mirror III 2.0 78
Delrina Technology Winfax Pro 2.0 74	Takeover 2.0 169
Symantec/PC Anywhere III V.3.11 67	Triton Technologies Co/Session 5.0 109

**Canon
Bubble Jet
Printer BJ 10EX**



\$318

Use it as a desktop or portable, the Bubble Jet prints anywhere. You get letter quality precision text and graphics. Now has Epson emulation.

Compatible with a wide range of software, and it prints on a variety of paper.

PROGRAMMING

Asymetrix Corp. Toolbook 1.5 for Windows 295	C Compiler 6.0 315
Borland International Borland C++ V2.0 329	Macro Assembler 6.0 89
Borland ObjectVision 89	MS Quick C for Windows 139
Turbo C++ 2Nd Ed V1.0 74	MS Source Profiler 59
Turbo Debugger and Tools 110	Quick C 2.5 69
Turbo Pascal for Windows 179	Quick Pascal 1.0 65
Turbo Pascal Pro 6.0 199	QuickBasic 4.5 69
Digital Smalltalk DOS V3.0 74	Visual Basic for Windows 128
Smalltalk V Windows Vers. 299	Windows 3.0 SW Dev.Kit 318
Smalltalk/V 286 1.1 118	Windows Device Driver Kit 365
Harvard Associates PC Logo 3.0 55	Solution Systems Brief For C++ 95
Knowledge Garden Knowledge Pro for Wndws 399	C Worthy 325
Microsoft Corporation Basic Prof.Dev.System 7.1 319	Dbrief 95
	Sourcerer's Apprentice 359
	Spinnaker Spinnaker Plus 2.0 275
	True Basic True Basic 2.1 51

**Computer Associates
Simply Accounting
for Windows**

\$139

This program contains everything you need to computerize your accounting: a primer that walks you through basic accounting principles, understandable documentation, software with a real-life tutorial and sample data, and six different, modifiable charts of accounts.



Hundreds of PC Gift Ideas

Give Endless Hours of FUN and Learning!

ENTERTAINMENT

Sphere Spectrum Holobyte

Falcon AT 29

Accolade

Jack Nicklaus Greatest 18 39

Jack Nicklaus Unltd. Golf 35

Test Drive III 37

Artworx

Strip Poker III for PC 39

Broderbund

SimEarth PC 43

SimCity 1.07 For PC 29

SimCity Graphics #1 Ancient 24

Where in Europe Is Carmen 29

Where in USA Is Carmen 29

Where in World Deluxe Ed. 49

Where in World Is Carmen 29

Where in Time Is Carmen 29

Electronic Arts

Andretti's Racing Challenge 29

Chuck Yeager's AFT 2.0 30

Electronic Arts

Chuck Yeager's Air Combat 39

Earl Weaver Baseball 30

Grand Slam Bridge 22

Harpoon for PC 38

Hunt For Red October for PC 18

Life & Death II: The Brain 29

Life And Death for PC 32

M. Beacon Teach Typing PC 34

Megafortress Flight Old Dog 39

PGA Golf for PC 34

Secret Of Monkey Island 45

Mediagenic

Shanghai II For PC 29

Microprose

F-19 Stealth Fighter 37

Microsoft Corporation

Aircraft & Scenery Design Kit 26

Flight Simulator 4.0 39

Windows Entertainment Pk. 26

Origin

Ultima VI for PC 45

Wing Cdr. Secret Mission 2 20

Wing Cdr. II Speech Disk 14

Wing Cdr. for PC 45

Wing Commander II 49

Wing Cdr. Secret Missions 20

Sierra

King's Quest IV 32

King's Quest V - VGA 39

Sphere Spectrum Holobyte

Tetris for PC 21

Spinnaker

Sargon IV for PC 31

The Software Toolworks

Chessmaster 3000 for PC 31

Game Pack I 35

Toyogo

Nemesis Go Junior 22

Nemesis Go Master 39

Nemesis Go Master Deluxe 87

Nemesis Joseki Genius 29

Virgin Mastertronic

Scrabble Deluxe Ed. 32

Xor

Basketball Challenge for PC 25

NFL Challenge for PC 59



Origin Wing Commander II

\$49

Mankind still needs a hero, and you're still the best pilot in the Galaxy. The

fate of humanity is in your hands! Get a gripping story line, state-of-the-art graphics, instant replay and thrilling music and digitized speech. More than a sequel—it advances the state of the art in computer gaming!

Microsoft Flight Simulator 4.0

\$38



Microsoft

The world's most popular flight adventure more true to life than ever! Now you can even create the plane, jet, or sailplane you've always wanted to fly...then put it to the test in challenging weather you select as you wing your way to any of 118 airports. A new dynamic panning feature covers every angle.

**Microsoft
Entertainment
Pack 2&3**

\$26

Fun and games for Windows! Vol. 2 has seven challenging games that can turn into an

entire evening of unplanned entertainment. Included are great screen-savers. Vol. 3 gives you seven new amusing diversions, including Fuji Golf, plus more spell-binding screen-savers.

FOREIGN LANGUAGES

Hyperplot Software Co.

French Pronunciation 55

French Tense Tutor 55

German Word Torture 29

Italian Word Torture 29

Spanish Pronunciation 55

Spanish Tense Tutor 55

Spanish Word Torture 29

Microtasc Software

French Assistant 49

German Assistant 49

Italian Assistant 49

Spanish Assistant 49

Penlon Overseas

French Level I 34

French Level II 34

German Level I 34

Penlon Overseas

German Level II 34

Japanese Level I 34

Japanese Level II 34

Russian Level I 34

Russian Level II 34

Spanish Level I 34

Spanish Level II 34

CD ROM

NEC Home Electronics

Clip Art 3D CD ROM 258

Whitestar Mageware

Aloha Hawaii 49

Golden Immortal 49

Sophisticated Santa Fe 49

EDUCATION

Davidson & Associates

Math Blaster Mystery for PC 34

New Math Blaster Plus 29

Individual Software

Professor Windows 26

Learning Company

Magic Spells 22

Math Rabbit 23

Outnumbered 32

Reader Rabbit 29

Treasure Mountain 32

Microsoft Corporation

Learning DOS 3.0/DOS 5 35

Windows Productivity Pack 39

Simon And Schuster

Typing Tutor V DOS 29

Typing Tutor V Window 30

The Software Toolworks

World Atlas 2.0 41

True Basic

Algebra 4.0 39

Algebra Workbook 10

Calculus 4.0 42

Calculus 4.0 Workbook 10

Pre Calculus 4.0 42

Pre Calculus Workbook 10

Walt Disney Software

Ducktales Quest For Gold 14

Zondervan Electronic Pub

NIV PC Bible Study 99

Broderbund Software Where in America's Past is Carmen Sandiego?

\$28

NEW!



The newest in the Carmen Sandiego adventure series lets you travel to historical hideouts in North America between 986 to 2000 AD. All new villains, clues, graphics and animations!

Berkeley Systems After Dark for Windows

\$28

Prevent screen burn-in with After Dark—the ultimate screen saver now optimized especially for

Windows. 35 fantastic displays include sound. You can customize with your company logo or graphics, type in messages or set up slide show style presentations. Provides screen-locking protection. Supports monochrome and color.



**CALL FOR OUR
FREE CATALOG 1-800-258-8088
USA OR CANADA**

- All major credit cards accepted. No surcharge.
- Your credit card is not charged until your order is shipped. If we must ship a partial order, freight is not charged on back order.
- Most personal and company checks received by mail will clear immediately. All checks or purchase orders must have a phone number and contact person listed in order to be processed.
- C.O.D. orders are accepted: Limit \$1,000 per order. Cashier's check or money order only. Add \$5.00 per C.O.D. order.
- Educational, government and corporate purchase orders are accepted.
- All U.S. shipments insured at no extra charge.
- No sales tax, except for Washington State residents (add 8.2%).
- Prices and product availability subject to change without notice. All specials and promotions are limited to available stock. Please call for current prices.
- All products covered by 120 day limited warranty.
- Shipping is \$6 per order. We ship via Airborne Express Overnight service. (Some rural areas require an extra day for delivery).
- Monitors are assessed an additional shipping charge: \$25.00 for Full Page, \$50.00 for Two Page. UPS Rates are also available upon request.
- Orders placed by 9pm ET (5pm PT) weekdays for "in stock" items will ship that day for overnight delivery (barring system failure, etc.).
- APR/PC/PO box orders are shipped first class U.S. Mail.
- Defective software will be replaced immediately, and hardware will be repaired or replaced at our discretion.
- For Customer Service call 1-800-248-8088. A Return Authorization Number is required for any product returned. Please call weekdays from 9am to 5pm PT, 9am-11pm ET.

PC Zone 18005 NE 68th St, Suite A110 Redmond, WA 98052
International: 206-883-3088 • FAX: 206-881-3421

MULTIMEDIA & MUSIC

Activision

The Music Studio 3.0 58

Ad Lib

Ad Lib Music Card 95

Alimtech

Icon Animate 85

Autodesk, Inc.

Autodesk Animator 255

Autodesk, Inc.

Autodesk Animator Clips 314

Brown Wagh Publishing

Sound Blaster 1.5 128

Dynaware USA, Inc

Dynaware Ballade 2.0 DOS 116

Dynaware Dynaduet DOS 145

I.B.M.

Hollywood 1.0 for Wndws 339

Storyboard Live V1.0 269

Ibis

Play It By Ear 75

Ibis

Rhythm Ace 59

MediaVision/Pro Audio

Spectrum Sound Board 258

Owl International

Owl Guide 3.0 378

Passport Designs

Encore! for PC 390

Master Tracks Pro for PC 259

Trax For PC V2.0 59

CALL NOW • 1-800-258-8088 • OPEN 24 HOURS

SCSI Express and CoreDriver use NetWare's bindery for their user list; from there the supervisor can organize groups and restrict authorization to access a particular database.

CD Net allows the supervisor to write batch files for users who regularly access one database. These files include the commands to load the retrieval software for that particular database while steering past any others. The accompanying server hardware is a tower that comes with a locking door over the CD-ROM drives, keeping out thieves as well as dust. Other products, including CoreDriver, keep a CD-ROM drive's eject button from working as long as the database within is "mounted," or ready for access.

The vast majority of CD-ROM databases available today have no need for MSCDEX or its equivalent once your system has established its connection.

Before you buy, you should also check whether the CD-ROM applications you plan to use require MSCDEX to run. The vast majority of CD-ROM databases available today have no need for MSCDEX or its equivalent once your system has established the connection. However, if the CD-ROM application requires that you load MSCDEX, the application probably won't run with SCSI Express.

Once you've found a product that seems to match your price criteria, network type, existing configuration, need for daisy-chaining devices, security requirements, and other factors, the last hurdle is speed. PC Labs has attempted to duplicate the most-common methods of CD-ROM access by individual workstations during this evaluation. The tests that most closely resemble your own anticipated usage will support an extremely vital point: Properly configured LAN access to CD-ROM-based data should justifiably ease the wait for one of the slower forms of electronic media. Read on to see which one is best for you.

CONNECTIVITY NETWORKING CD-ROMs

CBIS INC. CD Server/386 *CD Connection,* Version 2.20C by Greg Pastrick

When *PC Magazine* last looked at networked CD-ROM systems ("Networking CD-ROMs," February 27, 1990), CBIS's CD Server/386 shared the Editors' Choice award with LANtastic, a DOS-based LAN with CD-ROM support. Back then, CBIS was the only company to offer a solution that bundled software with a full-fledged CD-ROM server. Today its dedicated CD Server/386 and *CD Connection*, Version 2.20C, duo face stiff competition from Meridian Data's CD-ROM server and software package, as well as offerings from Corel Systems Corp. and Micro Design International.

You can purchase a complete CD-ROM server and software networking solution



CBIS offers a number of hardware configurations to work with *CD Connection*, Version 2.20C, including the CD Server/386. This tower system, a 25-MHz machine, holds up to 8MB of RAM on the motherboard, as many as seven Hitachi 3650 CD-ROM drives, and an ASC 88 SCSI interface. Additional expansion chassis can increase the number of supported CD-ROM drives to 21.

from CBIS, or you can opt for the software by itself. The CD Server/386 package that we tested included a 25-MHz 386 system with 4MB of RAM, seven built-in Hitachi 3650 CD-ROM drives, a monochrome display card, an ASC 88 SCSI interface, a standard AT-style keyboard, and *CD Connection* licensed for unlimited user access—all for a reasonable \$12,175. Two additional expansion chassis can increase the number of drives to 21. We used only 5 of the drives in our tests; a unit with that configuration costs \$9,485. The 386 tower system comes standard with 4MB of RAM and expands to 8MB on the motherboard and up to 32MB total with additional memory boards.

CD Connection by itself has a base price of \$695 for an 8-user license, \$1,395 for up to 100 users, and \$1,995 for any number above that. The software is rated to support up to 255 users and 240 dedicated servers per network.

CD Connection is directly supported by CBIS's own operating system, *Network-OS*. This redirector package is also compatible with Novell IPX, *MS-Net*, generic NetBIOS, Novell's NetBIOS emulation, Intel's *Open Net*, *Pathworks*, IBM's *PC LAN*, *3+Open LAN Manager*, and *VINES* networking software.

THE CD SOFTWARE

CD Connection allows each workstation to access simultaneously up to 21 CD-ROM drives per server. While CBIS supplies Microsoft's MS-DOS CD-ROM Extensions for applications that absolutely

CD Connection Ver 2.20C				
Server Name	: CDSERVER	DRIVE MAP		
Maximum Users	: 16	Device	Unit	Net-Unit
Network Buffers	: 4	CDROM001	0	0
Network Buffer Size	: 6K	CDROM001	1	1
Files per User	: 100	CDROM001	2	2
Active Users	: 0			
Abnormal Logoffs	: 0			
Read Requests	: 0			
Total Sectors	: 0			
Cache Reads	: 0			
Disk Read Errors	: 0			
Disk Changes	: 0			
Event Log				
5 50 46 System started				

With *CD Connection*, administrators can check the network system status from the server. Administrators can also include optional parameters to load workstation software into high memory, increase buffer sizes, and alter network timeouts with the redirector.

Where can you get every font you'll ever need for your LaserJet III?

Try the Library.

Our Complete Font Library Cartridge™ for the LaserJet III family of printers has 51 different typestyles, each scalable to virtually any size, so that you can make your point like never before.

Just as a library has books on every topic, our Complete Font Library Cartridge has a typeface for every kind of document you create. Choose from classic typefaces for proposals, letters, and presentations. Or from designer styles for flyers, invitations, and advertising materials.

You see, each of your documents has a different message. And, the way that message is perceived depends greatly on the typeface and point size you choose. A CG Century Schoolbook means business. A CG Bodoni says style. While Cooper Black expresses creativity. Messages like this are difficult to portray when you only have access to the one or two typefaces resident in your laser printer.

Our cartridge is unlike any other cartridge for your LaserJet III, IIID, IIIP, or IIISi. That's because our breakthrough windowing technology has allowed us to put what was previously in two separate cartridges, into a single cartridge. The result? Inexpensive and convenient access to every font you'll ever need for your LaserJet III, IIID, IIIP, or IIISi.

Free Desktop Publishing Kit

Call for your free introductory kit which includes: *The PC is not a Typewriter* (\$9.95) from PeachPit Press, a book to help you create professional-looking documents; a point size ruler for fonts, plus valuable offers on our products. Quantities are limited. So call now! To order your kit or for a dealer near you, contact Pacific Data Products, (619) 597-4639, Fax (619) 552-0889.

Complete Font Library Cartridge is a trademark of Pacific Data Products, Inc. HP and LaserJet are registered trademarks of Hewlett-Packard Company. Scalable type outlines are licensed from Agfa Corporation. CG Century Schoolbook and CG Bodoni are registered trademarks of Agfa Corporation. Pacific Data Products Inc. 9125 Rehco Road, San Diego, CA 92121. EUROPEAN OFFICES: Geneva Tel (41) 22 41 26 50, Fax (41) 22 41 06 82, France Tel (33) 1 39 23 20 00, Fax (33) 1 39 63 31 20, U.K. Tel (44) 442 23 14 14, Fax (44) 442 23 65 40. © 1991 Pacific Data Products, Inc.

AGFA 

PACIFIC
DATA PRODUCTS

CONNECTIVITY

NETWORKING CD-ROMs



NETWORKING CD-ROM DRIVES: SUMMARY OF FEATURES

Products listed in alphabetical order

					
	CD Server/386	CD Net Integrated System Model 314	CorelDriver Optical Disk Interface Kit	Opti-Net	SCSI Express
List price	With CD Connection (unlimited users), \$9,485; software only (8 users), \$695	With CD Net (unlimited users), \$14,475; software only (2 users), \$500	With CorelDriver (8 users), \$1,045	\$795 (8 users)	\$795 per network
Distribution channel	Dealers, direct, VARs	Dealers, VARs	Direct, VARs	Direct, VARs	Dealers, direct, VARs
PRODUCT TYPE					
Redirector	■	■	□	■	□
NLM-based package	□	□	■	□	■
CD-ROM SERVER					
Server operating systems supported:					
LAN Manager	■	■	□	■	□
NetBIOS	■	■	□	■	□
NetWare	■	■	■	■	■
VINES	■	■	□	■	□
Requires a dedicated server	■	■	□	□	□
Can use expanded/extended memory for disk caching	■/■	■/■	□	■/□	□
SECURITY					
Uses NetWare security	■	■	■	□	■
Software locks mounted CD-ROMs in drives	■	□	■	□	■
OPERATIONAL FEATURES					
MSCDEX required in workstation	□	□	■	■	□
Maximum number of CD-ROM drives supported per server	21	14	7	64	56
Maximum number of CD-ROM servers supported per network	240	29	Unlimited	9	Unlimited
Diagnostic and monitoring utilities	■	■	■	■	□
Global workstation updates from central location	■	■	□	■	□
Server software accessible by TCP/IP	■	■	□	□	■
Server software can be addressed by asynchronous hosts:					
Digital Equipment Corp.	□	■	□	□	■
Hewlett-Packard	□	■	□	□	■
IBM	□	■	□	□	■
VENDOR-SUPPLIED CD-ROM SERVER HARDWARE					
Bus architecture	ISA	ISA	N/A	N/A	N/A
Case type	Tower	Tower	N/A	N/A	N/A
Dimensions (HWD, in inches)	24 x 7.5 x 21.8	25.5 x 14 x 13	N/A	N/A	N/A
Motherboard manufacturer	Biostar	Meridian	N/A	N/A	N/A
Chip set manufacturer	C&T	C&T	N/A	N/A	N/A
Processor	80386/25	80386/20	N/A	N/A	N/A
Installed RAM (tested configuration)	4MB	4MB	N/A	N/A	N/A
Maximum installable RAM	8MB	8MB	N/A	N/A	N/A
BIOS version	AMI 3.1	AMI	N/A	N/A	N/A
Number of CD-ROM drives (tested configuration)	5	5	N/A	N/A	N/A
Number of CD-ROM drive bays	7	14	N/A	N/A	N/A
Manufacturer of CD-ROM drives (tested configuration)	Hitachi	Toshiba	N/A	N/A	N/A
CD-ROM SCSI adapter (tested configuration)	ASC 88	Western Digital 7000	Adaptec	None included	None included
Additional components	Monochrome video adapter, keyboard	Monochrome video adapter	None	None	None

—Editors' Choice

☒—Yes

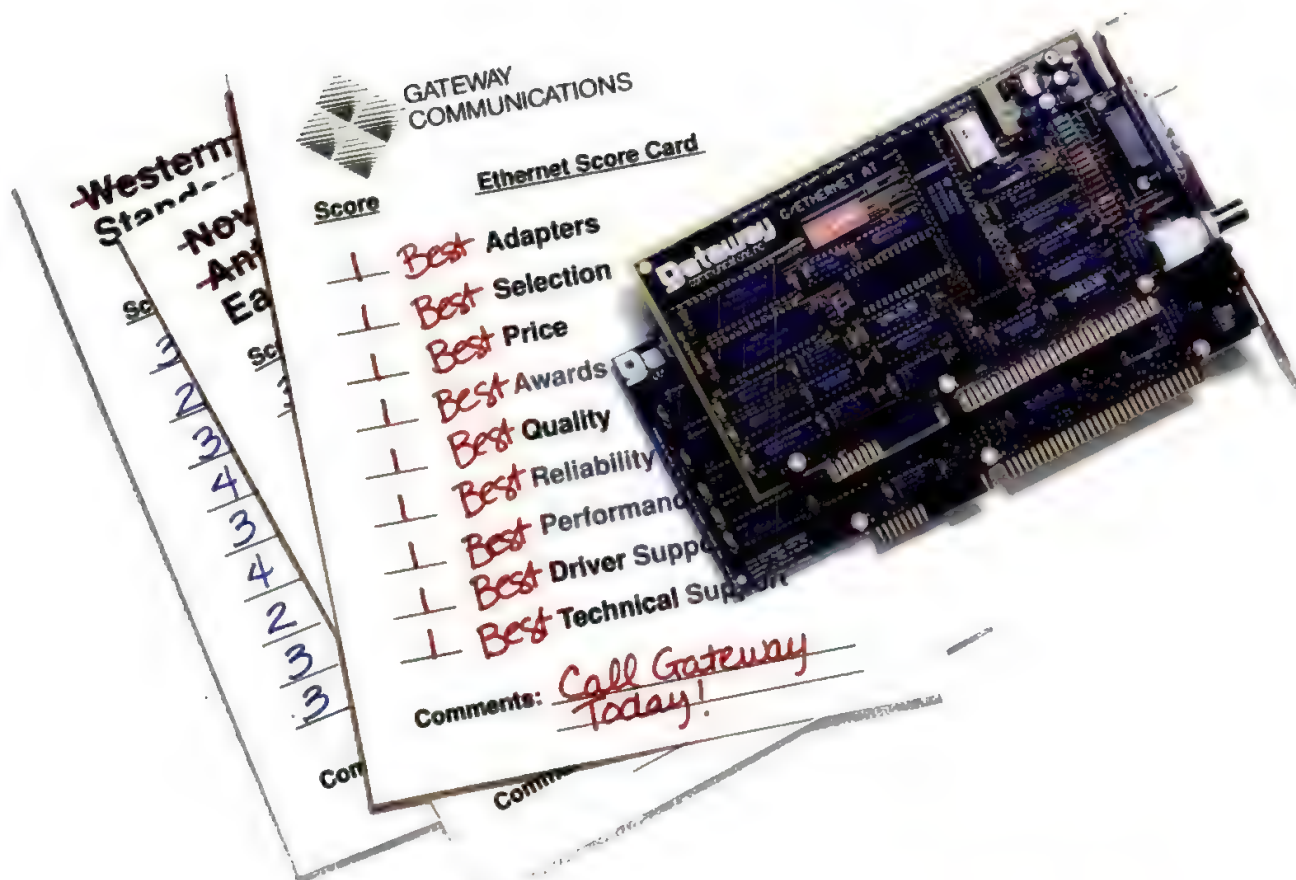
☐—No

N/A—Not applicable: This is not a hardware product.

AMI—Advanced Megatrends Inc.

C&T—Chips and Technologies Inc.

If You Want The Best Ethernet Adapters, Your Choice Is Clear.



Most companies make an average Ethernet adapter. But, for superior quality, reliability, and performance, all you have to do is choose Gateway.

Our award-winning G/Ethernet and G/Ether-Twist LAN adapters give you the widest selection of adapters, the most complete line of operating system drivers, and more. All at the best price.

So choose Gateway, and get the best value for your networking dollar.

Gateway
communications, inc.

2941 Alton Ave. • Irvine, CA 92714
(714) 553-1555 • (800) 367-6555



All trademarks are of their respective manufacturers.



PERFORMANCE TESTS: NETWORKING CD-ROM DRIVES

For almost every product, when two or more CD-ROM drives were simultaneously accessed by their corresponding workstations, our tests showed a marked drop in throughput rate. SCSI Express showed a noticeable drop in throughput rate only when three or more drives were in use. SCSI Express's performance remained at the leading edge throughout.

WHAT THE NUMBERS MEAN

All the products showed decreased throughput as we increased the number of simultaneously active CD-ROM drives and workstations. The throughput scores for CD Net Integrated System (tested as a hardware/software combination), *CD Connection* (without CBIS's hardware), and *Opti-Net* were cut nearly in half when we added only a second CD-ROM drive and a second workstation to the network. But in the case of CD Net Integrated System, the scores were still among the better ones we saw.

Even though companies such as CBIS and Meridian Data have tailored their drivers to the CD-ROM SCSI adapters they include in their tower servers, these combinations did not surpass the performance of the same companies' software when tested on our standard test-bed. The slowest product we reviewed was the CBIS

software (*CD Connection*) when tested on its own server; its most noticeable degradation in performance came when three or more workstations accessing drives were added to the network. Though *CD Connection's* performance on our standard test-bed was better than its performance in conjunction with CBIS's server, the drop-off in throughput with three or more workstations accessing drives was significant. CBIS attributes the low performance to a software bottleneck that occurs when data is being sent to the network. The company is working on solving the problem.

With *Opti-Net*, we found that there was an uneven servicing of users when more than three workstations were accessing drives. This resulted in the product's poor performance on our Random Throughput tests. Online attributes this to an anomaly in *Opti-*

HOW WE TESTED

These performance tests measure the degradation in sequential and random throughput that occurs when multiple workstations simultaneously access multiple networked CD-ROM drives and when multiple workstations simultaneously access a single networked CD-ROM drive. First we measured the throughput of the CD-ROM networking package when a single workstation accessed a single CD-ROM drive. Then we increased the load by adding a second workstation accessing a second CD-ROM drive, then a third workstation accessing a third CD-ROM drive. We continued to increase the load until five workstations were accessing five CD-ROM drives.

We also measured the throughput of the CD-ROM networking package when five workstations simultaneously access the same networked CD-ROM drive.

Each of these sequential and random throughput tests was run three times; we report the average of those three runs. For these tests, we used *Compton's MultiMedia Encyclopedia*, a CD-ROM database from Britannica Software.

The CD-ROM tests simulate the ways in which applications are accessed, either randomly or sequentially, and measure each product's effectiveness at handling these methods of access. The throughput rate for the Random Throughput tests is generally lower than for the Sequential Throughput tests because the bottleneck during random accesses is the drive

mechanism, whereas the bottleneck for sequential accesses tends to be the CD-ROM controller and drivers. It's usually easier (and therefore cheaper) to design a fast CD-ROM controller and drivers than a fast, durable mechanism.

THE EQUIPMENT

We performed our tests using 16-MHz Compaq 386/Ns equipped with 5MB of RAM as the workstations; each Compaq included a 3Com EtherLink II as the LAN adapter. For the *NetWare* 3.11 server, we used a Compaq Deskpro 386/25e with 16MB of RAM and a Novell NE2000 LAN adapter.

We tested most products in all the configurations that the vendor makes available. CD-ROM networking solutions from CBIS (*CD Connection*) and Meridian Data (*CD Net*) can be purchased either as software only or as software bundled with CD-ROM server hardware. Online Computer Systems offers its *Opti-Net* as a software-only solution. Corel Systems Corp. sells its CorelDriver Optical Disk Interface Kit with an Adaptec 1540 (ISA), 1640 (MCA), or 1740 (EISA) CD-ROM controller; the company supplied the 1540 for testing. Micro Design International (MDI) can sell its *SCSI Express* as a package with any one of those Adaptec controllers plus a Toshiba CD-ROM drive, or as a software-only solution. The company supplied us only with the software for this review.

When we tested the software-only

redirector offerings from CBIS, Meridian, and Online, the CD-ROM server was a Compaq Deskpro 386/25e equipped with 8MB of RAM, five Sony 7211 drives, and the Novell NE2000. The system also included a Future Domain CD-ROM controller, which Sony recommends.

CBIS and Meridian also supplied us with their own tower-style CD-ROM servers for use in testing their software. The system CBIS supplied was a 25-MHz 386 with 4MB RAM, five Hitachi 3650 CD-ROM drives, and an ASC 88 CD-ROM SCSI controller. The system Meridian supplied was a 20-MHz 386 with 4MB of RAM, five Toshiba 3301 CD-ROM drives, and a Western Digital CD-ROM SCSI adapter.

For the products from Corel and MDI, a separate CD-ROM server is not required; the *NetWare* server does double duty in that role. The Corel and MDI software reside inside Novell's server as NLMS (although unlike MDI, Corel also requires that additional drivers be installed on the workstations in the manner of redirectors). In these cases, we used the same Sony 7211 drives but added an Adaptec 1540 bus-mastering controller. We could not test these products with the Future Domain card because it does not support NLMS.

NETWORK ENVIRONMENT

All the products we reviewed implement disk caching. All except for *SCSI Express* and the CorelDriver Kit are pure redirectors and can run over LAN operating systems other than *NetWare*.

Net's scheduling algorithm, and plans to have a fix available by the time you read this.

Corel believes that by not applying the CD-ROM drives as *NetWare* volumes, it avoids adding extra overhead to the network operating system. With this in mind, as well as the advantage that the Adaptec bus-mastering controller offers to an NLM-based product, we expected better performance. Corel responded that the performance could have been improved if we had increased the size of the cache.

SCSI Express was the best performer on all our tests, including multiple users simultaneously accessing a single CD-ROM drive.

Because of the way *SCSI Express* and the CorelDriver Kit are implemented, they require a *NetWare 386* network. *SCSI Express* makes a CD-ROM drive a mounted volume on a *NetWare* server. *NetWare* supplies the cache to each CD-ROM drive on the fly as needed, a technique that proved to be most effective on our performance tests. The advantage of the caching scheme is that *NetWare* automatically allocates cache as required.

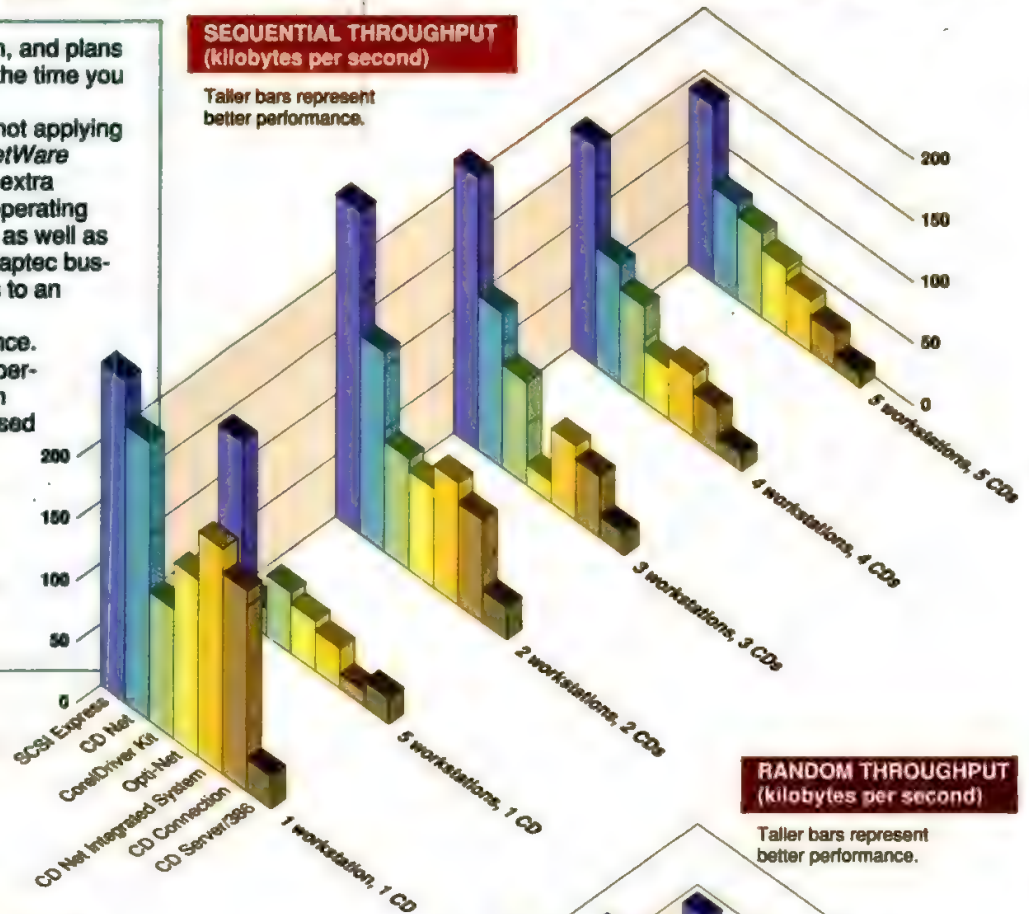
The CorelDriver Kit does not make the CD-ROM drive a mounted volume. Corel's own NLM automatically defaults to allocating 512K of cache RAM from the server to each CD-ROM drive (this cache RAM can be increased to 2MB).

With the redirectors, the software drivers supplied by each vendor determine the amount of cache to be allocated to each drive. The default is usually 64K, but the administrator generally can change that manually.

We tested all the products with the vendors' recommended default settings. Changing the default parameters may increase performance slightly.

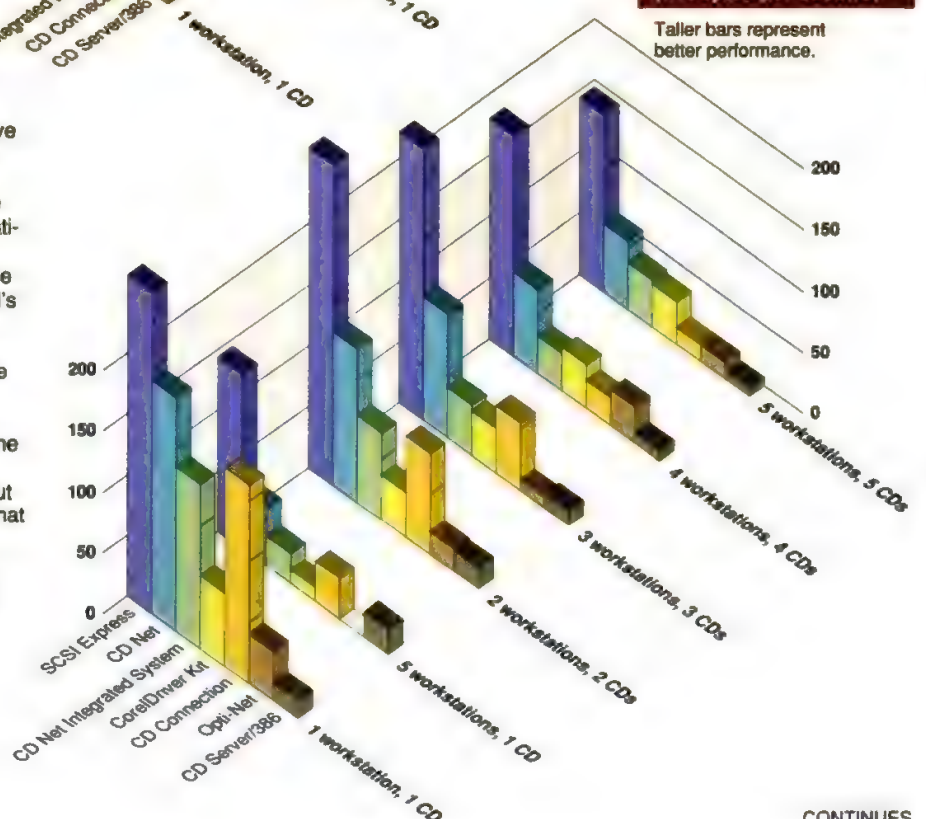
SEQUENTIAL THROUGHPUT (kilobytes per second)

Taller bars represent better performance.



RANDOM THROUGHPUT (kilobytes per second)

Taller bars represent better performance.



CONTINUES

PERFORMANCE TESTS: NETWORKING CD-ROM DRIVES

SEQUENTIAL THROUGHPUT (kilobytes per second)

■ The **Sequential Throughput** test is calculated by measuring the average time required to read 1MB of contiguous binary data in block sizes of approximately 16K. Sequential throughput reflects the performance of a CD-ROM networking product in handling requests from multiple users over the network, during such operations as loading large data files and programs from a selection of CD-ROMs.

Higher scores represent better performance.

	1 workstation, 1 CD	5 workstations, 1 CD	2 workstations, 2 CDs	3 workstations, 3 CDs	4 workstations, 4 CDs	5 workstations, 5 CDs
SCSI Express	263	144	263	222	180	144
CD Net	226	23	162	126	97	77
CorelDriver Kit	105	50	90	84	77	68
Opti-Net	143	41	80	17	41	55
CD Net Integrated System	182	33	99	61	50	42
CD Connection	163	12	83	50	37	29
CD Server/386	27	21	27	18	14	11

RANDOM THROUGHPUT (kilobytes per second)

■ The **Random Throughput** test is calculated by measuring the average time required to perform noncontiguous reads of 1MB of ASCII data in block sizes of approximately 16K. This reflects the performance of the CD-ROM networking product in reacting to multiple user queries over a network, addressed to data stored on a variety of CD-ROMs.

Higher scores represent better performance.

	1 workstation, 1 CD	5 workstations, 1 CD	2 workstations, 2 CDs	3 workstations, 3 CDs	4 workstations, 4 CDs	5 workstations, 5 CDs
SCSI Express	264	144	262	222	180	144
CD Net	191	48	126	102	69	55
CD Net Integrated System	135	25	71	41	31	22
CorelDriver Kit	59	11	37	36	36	35
CD Connection	163	33	83	55	23	14
Opti-Net	41	N A	19	9	30	14
CD Server 386	15	20	18	12	8	7

N/A—Not applicable: The product was not able to run this test

ENDS

need it, *CD Connection* does not require this installation.

The dedicated CD-ROM server contains an automatic CD-ROM system configuration program, a disk-caching utility that CBIS calls a CD data accelerator, and a SCSI host adapter driver. The redirector and drive-mounting utilities load from each workstation.

Installation of *CD Connection* begins with copying the configuration program, data accelerator utility, and device driver to the dedicated CD-ROM server. If you choose, the program will alter the AUTOEXEC.BAT and CONFIG.SYS files and save the settings to its own configuration file for reference. The configuration program uses menus to prompt the administrator through several tasks, such as inputting the number of users and assigning drive letters to each CD-ROM device. It also lets you select from options to access expanded or extended memory. Although only 640K is required, CBIS recommends that a minimum of 2MB be installed on the CD-ROM server; the software will make maximum use of whatever extra memory is available for caching. Because the proprietary CBIS device driver for the CD/386 integrated

system enables its caching algorithm, the disk-caching data accelerator utility is only used with a non-CBIS device driver.

Each workstation needs to run the drive-mounting utility and the appropriate redirector utility for your network software, either from the command line or from a batch file. These utilities take up about 22.5K of RAM per workstation on *NetWare* networks. The mounting utility simply maps a local, logical drive to the networked CD-ROM drive designated by a drive letter. With *CD Connection*, the user works straight from the DOS command line or from a batch file set up by the administrator. The CDSEE utility provides the volume label for CDs in the drives.

To enhance performance, you can include optional switch parameters that use the redirector to access high memory, increase buffer sizes, and alter network timeouts. You can check the CD-ROM network system status from the server monitor, but its screen updates tend to be somewhat misleading. For example, reported data-read errors are actually a measure of repeated attempts to read data. The system relies on the network software's own security features.

HARDWARE/SOFTWARE OPTION

On the integrated system solution side, CBIS offers a number of hardware configurations to work with *CD Connection*. These include 286-based tower systems; drive expansion tower chassis; and conversion units holding drives, cabling, and interface cards, all ready to attach to the CPU of your choice.

On the surface, the CD Server/386 meets all the requirements for a system that will essentially be locked away in a closet. But its general construction is not damage-proof or as solid and secure as the Meridian Data tower's. The first CD Server shipped to us was unbootable. This was hardly surprising, as its mini-AT motherboard arrived improperly secured to the somewhat flimsy chassis; chips could have easily been unseated in transit.

When we tested the software on our own dedicated CD server, *CD Connection* showed a marked degradation in throughput that was directly proportional to the number of workstations accessing CD drives. While *CD Connection* started out well enough, on the sequential and random file-access tests, its throughput slowed to a crawl whenever three or more workstations were accessing the CD-ROM

CONNECTIVITY NETWORKING CD-ROMs



FACT FILE

CD Server/386

CD Connection, Version 2.20C

CBIS Inc., 5875 Peachtree Industrial Blvd., Bldg. 100, #170, Norcross, GA 30092; 404-446-1332.

List Price: CD Server/386: with 4MB RAM, five Hitachi CD-ROM drives, monochrome video adapter, keyboard, *CD Connection*, SCSI interface, \$9,485; with seven drives, \$12,175. *CD Connection*: for 8 users, \$695; for 100 users, \$1,395; for unlimited users, \$1,995.

Requires: Workstation with 256K RAM, DOS 3.1 or later, *NetWare* 2.15 or later or *NetBIOS* network. For *CD Connection* (purchased alone): CD-ROM server with 640K RAM, DOS 3.1 or later, CD-ROM drive(s). 2MB RAM recommended.

In Short: Once an Editors' Choice product, CD Server/386 with *CD Connection* has not kept pace with the performance and capabilities of its main competition, Meridian Data's CD Net Integrated System Model 314. Even as standalone software, *CD Connection* is no match for its redirector and NLM competition.

CIRCLE 804 ON READER SERVICE CARD

nical support is direct and extremely helpful. A toll number is open weekdays from 9:00 to 7:30 E.S.T. Additionally, CBIS offers three-day network and CD-server training classes for \$75, or on-site installation, including training and troubleshooting, for \$1,300.

While *CD Connection* on its own or in conjunction with the CD Server/386 may suffice in an office where few users need to share CD-ROM drives, those with more-intensive needs may want to think twice. Granted, real-world usage of CD-ROM servers does not always match the push-it-till-it-breaks environment of PC Magazine Labs. But after comparing the test performance of both CBIS products with that of Meridian Data's offerings, buyers should realize they could do better elsewhere.

COREL SYSTEMS CORP.

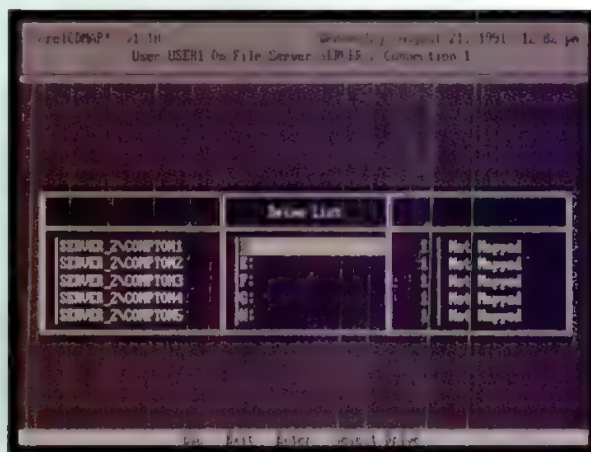
CorelDriver Optical Disk Interface Kit

by Ed Perratore

Corel Systems Corp.'s CorelDriver Optical Disk Interface Kit merges the redirector and NLM approaches to CD-ROM networking. A true NLM that takes advantage of *NetWare*'s integration, security, and other benefits, *CorelDriver* also acts like a pure redirector by putting some of its memory load on the workstations and requiring a dedicated cache in the server.

You can purchase Corel's interface Adaptec board/software combination in a CD-ROM-only version (which we tested)

Users accessing multiple CD-ROM drives through *CorelDriver* invoke the CDMAP utility to assign an available drive letter to each CD-ROM database disk. Choices offered (in this case, multiple copies of a single database disk) are set via user/group rights established by the supervisor through a CDCON utility.



or in a universal version that also supports SCSI-compatible WORM, erasable, and multifunction optical drives. For CD-ROM use only, the list price is \$1,045 for 8 users, \$1,295 for 20 users, and \$2,995 for 100 users. Add \$200 to each price for a Micro Channel architecture (MCA) version of the Adaptec board. The universal version comes with one 16-bit ISA (Industry Standard Architecture) Adaptec board and a \$1,145 license for 8 users, \$1,345 for 20 users, or \$1,995 for 100 users.

Each Adaptec board will handle up to 8 SCSI devices. How many boards you can fit into your CD-ROM server is limited only by the number of available slots. When CD-ROM drives are released that support Logical Unit Numbers (LUNs), it may be possible to run up to 49 CD-ROM devices from one SCSI board.

If you already have one or more SCSI interface boards compatible with ASPI, you can buy *CorelDriver* by itself. The CD-ROM-only version of the software costs \$695 for 8 users, \$895 for 20 users, and \$1,995 for 100 users. The universal version lists for \$795 for 8 users, \$995 for 20 users, and \$1,595 for 100 users.

CorelDriver takes up about 750K of RAM for the first attached CD-ROM drive, plus 512K of cache RAM for each additional drive. All but 250K of that 750K is dedicated to caching and cannot be relinquished to *NetWare*'s general caching pool, unlike Micro Design International's faster-performing *SCSI Express*, Version 1.07 level A. You can reduce this memory to as little as 0 bytes, but any reduction drastically increases drive access times. You can also increase the amount of RAM for improved cache performance.

Each workstation accessing CD-ROM

server, even with disk caching. Our tests did not take advantage of *CD Connection*'s disk-mirroring or elevator-seeking capabilities, which can help increase throughput when multiple copies of the same CD-ROM disk are attached to the server.

Using CBIS's own hardware to test *CD Connection* produced even poorer throughput times. Even with fine-tuning the software, throughput did not improve (the test numbers reported were achieved with the default settings). CBIS's tailoring of its drivers for the SCSI adapter in its tower system did not help.

CBIS acknowledges that its software does not efficiently handle the larger block sizes required by our tests, and the company is working on a fix. While the software is at the heart of the problem, the CBIS hardware did nothing to improve the situation. The CD Server/386 is essentially an inexpensive clone stocked with generic components.

To CBIS's credit, the installation documentation is fairly complete, and the tech-

libraries must load Microsoft's MS-DOS CD-ROM Extensions (MSCDEX), which is included with the package, and set up to 30 2K buffers, plus a device driver. While the workstation's installation program is supposed to let you load all but about 35K into expanded memory, during our tests a bug prevented this from working. Corel was unable to fix the system so that the device driver could load into expanded memory, but the company plans to have the problem solved by the time you read this. All but 5K of MSCDEX can be loaded into expanded memory.

SIMPLE PROCESS

Setting up the CorelDriver system is a simple process. After installing the Adaptec board, your CD-ROM drives, and Corel's files, you load the kit's server software and make sure the *Network C Library for NetWare* is loaded. You should use the SCSI cables, since generic cables

may not work with the system.

Pop-up windows guide the network supervisor through the smooth creation and mounting of databases, attachment of drives, and monitoring of connected users. The supervisor can run CDCON from his or her own workstation to form groups, add users from the *NetWare Bindery*, and assign rights to access specific CD-ROM databases. Users run the CDMAP utility

*The CD Net products
behaved consistently
and reliably throughout
our testing.*

to map the server's CD-ROM databases to DOS drive letters. CDMAP is a menu-driven utility that gives users a list of available and accessible CD-ROM databases (the supervisor determines rights). After selecting a database, the user picks a drive letter for that database from the letters available. The software supports a mouse.

In testing, the CorelDriver Kit's speed dipped slightly with each workstation and drive added. Its scores typically were closer to those of the redirectors rather than those of its NLM near-counterpart, *SCSI Express*. *SCSI Express* was more than twice as fast as the CorelDriver Kit; Meridian Data's *CD Net*, Version 4.11, also boasted faster performance than the CorelDriver Kit. But Corel's product surpassed some redirectors that collapsed under heavier loads.

Documentation for the CorelDriver Kit packs plenty of information into a few small books, and Corel provides unlimited free technical support at a toll number weekdays from 8:30 to 5:00 E.S.T. and through a bulletin board system.

In some installations, *CorelDriver* may take up more RAM on workstations than users will like, and the only way to release cache memory in the server is to reset the software. Despite these drawbacks, *CorelDriver* provides transparent drive access across the network at acceptably midrange or better speeds. If your network is *NetWare 3.x* and server RAM is a consideration, *CorelDriver* Optical Disk Interface Kit deserves your attention.

MERIDIAN DATA INC.

CD Net Integrated System Model 314

CD Net, Version 4.11

by Greg Pastrick

Meridian Data's CD Net offerings are attractive packages for networking CD-ROMs. Available as either standalone software or in an integrated server/software system, the products' design and execution are well thought out. Good test performance reinforces the impression left by the neatly organized documentation, excellent support materials, and easy installation. The CD Net Integrated System Model 314 also makes for a stylish and sturdy server tower.

The CD Net products behaved consistently and reliably throughout our testing. *CD Net*, Version 4.11, has a \$500 base price with a license for 2 users, \$750 for 12 users, and \$1,500 for 102 users.

Server towers holding up to 14 CD-



CorelDriver Optical Disk Interface Kit
CorelDriver, Version 1.10

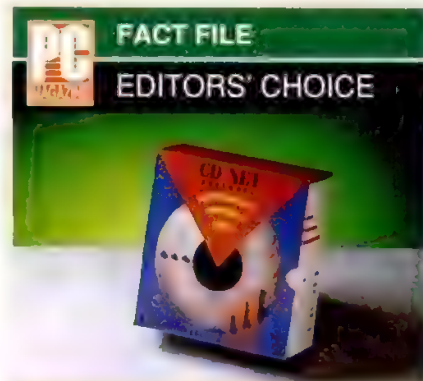
Corel Systems Corp., 1600 Carling Ave.,
Ottawa, Ontario, Canada K1Z 8R7; 613-728-
8200.

List Price: CD-ROM versions: CorelDriver Optical Disk Interface Kit (Adaptec board, *CorelDriver*, SCSI cable), for 8 users, \$1,045; for 20 users, \$1,295; for 100 users, \$2,195. *CorelDriver*, for 8 users, \$695; for 20 users, \$895; for 100 users, \$1,595. **Universal versions:** CorelDriver Optical Disk Interface Kit (Adaptec board, *CorelDriver*, SCSI cable), for 8 users, \$1,145; for 20 users, \$1,345; for 100 users, \$1,995. *CorelDriver*, for 8 users, \$795; for 20 users, \$995; for 100 users, \$1,595.

Requires: Workstation with 45K RAM, DOS 3.1 or later, *NetWare* 3.11 or later. CD-ROM server with 4MB RAM, DOS 3.1 or later, CD-ROM drive(s).

In Short: Though it takes up some workstation memory and requires a dedicated server cache, this product is a worthy choice for *NetWare 386* networks. It performed in the midrange or better on our tests, supports transparent user access to CD-ROM drives, and offers supervisors plenty of options for setting rights and monitoring usage.

CIRCLE 605 ON READER SERVICE CARD



CD Net Integrated System Model 314
CD Net, Version 4.11

Meridian Data Inc., 5615 Scotts Valley Dr.,
Scotts Valley, CA 95066; 408-438-3100.

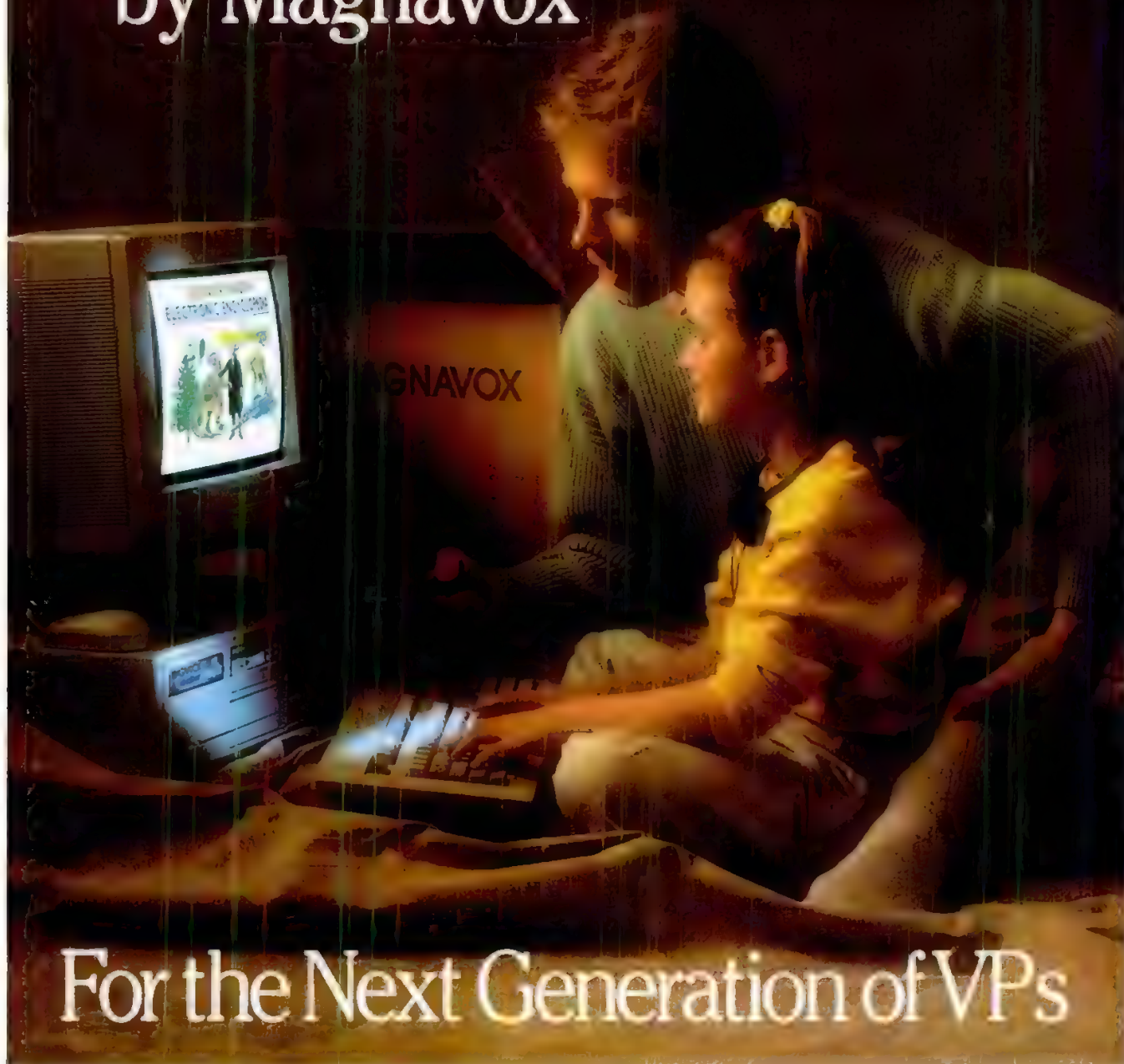
List Price: CD Net Integrated System: with 4MB RAM, five Toshiba CD-ROM drives, monochrome video adapter, *CD Net*, 5-user MS-DOS CD-ROM Extensions license, SCSI interface, \$14,475. *CD Net*: for 2 users, \$500; for 12 users (including 5-user MS-DOS CD-ROM Extensions license), \$750; for 102 users, \$1,500.

Requires: Workstation with 150K RAM, DOS 3.1 or later, *NetWare* 2.12 or later or NetBIOS networks. *CD Net* (purchased alone): CD-ROM server with 640K RAM, DOS 3.1 or later, CD-ROM drive(s).

In Short: Meridian Data offers highly efficient solutions for networking CD-ROM drives. The hardware is sturdy and well designed. *CD Net* is strong on administrative, data-handling, and diagnostic features, and it performed impressively on our tests. These CD Net products are well worth investigating.

CIRCLE 606 ON READER SERVICE CARD

The New Generation of PCs by Magnavox



For the Next Generation of VPs

MAGNAVOX WITH CD-ROM
Imagine...a personal computer
that accesses enough information
to fill a school library...
includes educational

WordPerfect®... and plays audio
compact discs through stereo
headphones.
Introducing...the PC of the future,
today.

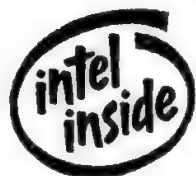
Try combining sound, graphics and
text in a single application.

The possibilities are endless. So
are the educational opportunities.
Magnavox. Today's PC for
tomorrow's VP.

The new Magnavox PCs use CD
laser technology to set them
apart - and ahead - of the rest.

The built-in CD-ROM drive allows
you and your child to instantly
access large volumes of informa-
tion on a brightly colored screen.

MAGNAVOX
Smart. Very smart.®



such as Lotus 1-2-3® and

CONNECTIVITY NETWORKING CD-ROMs

ROM drives come in two models, powered by either a 12-MHz 286-based processor card or a 20-MHz 386-based processor card. The version we tested was the \$14,475, 386/20-based Model 314, which includes 4MB of RAM, five Toshiba 3301 CD-ROM drives, a monochrome video adapter, *CD Net* for an unlimited number of users, and a Western Digital SCSI interface card. The amount of RAM is expandable to 8MB, and no keyboard is included. The company originally sent us the \$16,265 seven-drive unit, but two drives were dead on arrival. Luckily, our tests only required five active drives. The integrated system comes bundled with Microsoft's MS-DOS CD-ROM Extensions for five users. While MSCDEX is not included with the software-only package, you may purchase extended licenses direct from Meridian.

The company also offers the Model 100NC, a 286-based scaled-down tower that holds a maximum of eight drives and 4MB of RAM. In a configuration with five drives, 1MB of RAM, and no software, the Model 100NC costs \$9,375.

TAILORED TO THE ADMINISTRATOR

The automatic installation program quickly steps you through the process of setting up either the software-only version or the integrated system. With the software-only version, you can install the files on the hard disk of the machine that is configured as the dedicated server. If you are using Meridian's server tower, the software resides on a bootable floppy inserted in the 3.5-inch floppy disk drive on the rear of the unit. If you choose, you could install a hard disk in one of the tower's drive bays intended for CD-ROM devices, but it's probably not necessary for simply booting up. A diagnostic and system validation CD comes with both packages.

The workstation software installs either from the server or directly at each workstation through another automatic install program. Users can mount drives or select CDs either directly from the DOS command line or through a truly smart menu system included with the software. An additional utility configures the menu system and allows system administrators to set up multiple menu databases and CD-ROM access scripts for automatic mounting and application execution. This excellent feature, with versatile, system-wide application, points to one of the strengths of *CD Net*: It is

tailored to the network administrator. The administrator can set up the shared menu database files to include all possible CD titles or disks used on the system, but he or she must set the access menu to show users only the volume IDs or names of the disks currently loaded in the drives. The

CD Net v4.11			
Copyright (C) Meridian Data Inc. 1987-1991. All rights reserved.			
Server Name: CDMet_Server Thu Aug 15 1991 10:00:21			
% Utilization	83		
Remotes Free:	12		
Remotes Online:	2		
Requests Pending:	1		
Sends Pending:	1		
Sectors Read:	1583547		
Cache Size:	3375104		
Cache Hits:	1155422		
% Cache Hits:	72		
Reads Pending:	0		
Reads Complete:	0		
Read Errors:	0		
Misc Errors:	0		

Drive	Sector	ID	Label
0	153591	0066EA	COMPTONS130
1	188775	0066EA	COMPTONS130
2	188775	0066EA	COMPTONS130
3	188775	0066EA	COMPTONS130
4	188775	0066EA	COMPTONS130

The system status screens in Meridian Data's *CD Net*, Version 4.11, show useful information such as how much RAM is available for disk caching. The software also aids the system administrator by identifying cache hits, read errors, and sectors read, as well as the number of requests and sends pending.

administrator can choose to set the system so that a particular workstation loads only a specific menu database with a limited choice of CD-ROM selections.

The Mount command from the command line pops up a drive selection screen that shows the installed CDs and connected drives. By pressing the cursor and Spacebar keys, you can point to and select the drives you want to mount or unmount. If an application requires CDs to be mapped to more than a single drive letter, the administrator can add or change drive letter assignments as required. In addition, you can mount combinations of CD-ROM drives or multidisk applications.

SOLID PERFORMANCE

The software performance is what really counts. When *CD Net* is used as a stand-alone product or in combination with the CD Net Integrated System server, its efficient throughput handling is clearly evident. In tests with two users and two CD-ROM drives, the server/*CD Net* combination performed half as well as with a single user and drive—but still outshone a



Meridian Data's CD Net Integrated System Model 314 looks as good as it performs. The 14-drive bay tower case is a highly secure system, with a locking front panel and a heavy metal chassis. It comes with Toshiba 3301 CD-ROM drives, up to 8MB of RAM, and a Western Digital SCSI interface card. The company currently also offers 286-based systems and will soon provide 486-based models as well.

good number of its competitors. While the company says it tailors its drivers for the controller packaged in the server, *CD Net*'s performance was better when used with our standard test-bed than with the Meridian hardware.

CD Net's solid performance can be attributed to its CD-ROM disk caching and read-ahead algorithms, as well as its ability to process data requests and sends without creating a network bottleneck. Whether you install *CD Net* on Meridian's own CD server system or another model, the system status screens genuinely reflect system activity, such as data transmission, cache hits, and errors.

The CD Net Integrated System looks as good as it performs. The 14-drive-bay tower case provides a secure system with a locking front panel and a heavy metal chassis. Currently, Meridian offers only Toshiba drives and is phasing out its passive backplane design in favor of a motherboard that will hold the processor and up to 16MB of RAM.

By the time you read this, Meridian will have a new version of its software

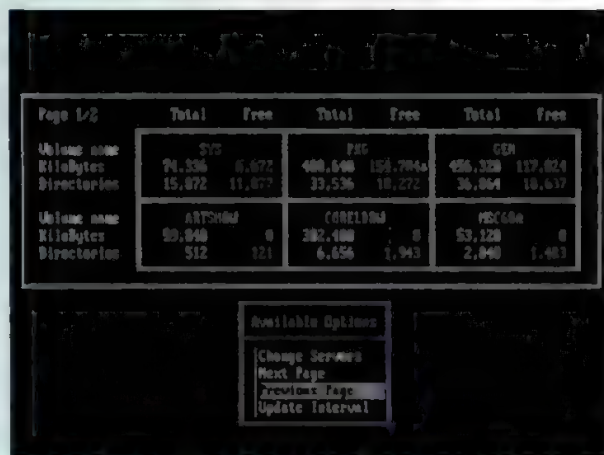
that will support *Microsoft Windows 3.0*, among other features. The company will also be offering a 486 and 386/33 server system.

The CD Net package's intelligently presented documentation contains good references and multiple user guides. For more help, the company provides toll-free technical support on weekdays, from 7:30 to 5:00 P.S.T.

Meridian offers functional and appealing hardware construction and styling, as well as efficient software that is strong on features and capabilities. Whether you buy *CD Net* by itself or as part of the integrated system, it is unlikely that you will be disappointed.

CONNECTIVITY NETWORKING CD-ROMs

SCSI Express, Version 1.07 level A, is a stealthy sort of program. It penetrates *NetWare 386's* ranks of code, only becoming visible to the administrator during operating system boot-up. And even then, it is effectively camouflaged, though it dramatically expands the number of different types of volumes recognizable by the networking software.



Page 1/2		Total	Free	Total	Free	Total	Free
Volume name		SYS		PDC		GEN	
KiloBytes	74,536	8,872	400,540	158,704	456,320	117,024	
Directories	15,872	11,877	33,536	10,272	36,064	10,637	
Volume name		ARTSHW		CORE10W		MSC68a	
KiloBytes	59,840	0	382,400	0	53,120	0	
Directories	512	121	6,656	1,943	2,040	1,483	

Available Options:
Change Servers
Next Page
Previous Page
Update Interval

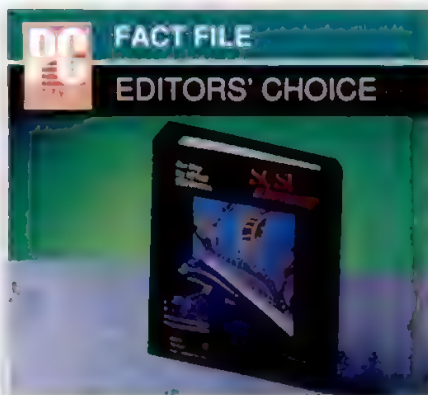
MICRO DESIGN INTERNATIONAL INC. *SCSI Express*, Version 1.07 level A by Kellyn Betts

Micro Design International's *SCSI Express*, Version 1.07 level A, improves on the approach to CD-ROM sharing offered by *CorelDriver* and the redirec-

tors. *SCSI Express* also significantly outperforms the competition on all our throughput tests. The \$795-per-network software-only option we reviewed capitalizes on *NetWare 3.x's* technological improvements to eliminate the redirector middleman in networked CD-ROM access.

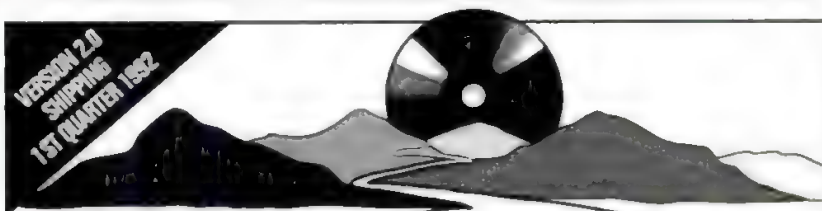
With *SCSI Express*, you access the

drive as usual, through a standard *NetWare* disk driver. *SCSI Express* makes each CD-ROM drive a mounted volume on a *NetWare* server. This approach dramatically increases access speeds and keeps them consistently high over a variety of tasks, even when a group of users is vying simultaneously for the use of a single CD. But the software will work



SCSI Express, Version 1.07 level A
Micro Design International Inc., 6985 University Blvd., Winter Park, FL 32792; 800-228-0891, 407-677-8333.
List Price: For each *NetWare* network, \$795.
Requires: Workstation: DOS 3.3 or later, *NetWare* 3.11 or later. CD-ROM server: 4MB RAM, DOS 3.3 or later, CD-ROM drive(s).
In Short: *SCSI Express* used *NetWare 3.x's* caching capability to deliver by far the fastest scores on all our tests. This was the only product that let five workstations access one drive simultaneously as quickly as five separate drives. It works with a wide variety of storage subsystems and offers easy installation, thorough documentation, and ease of use, making the program hard to beat.

CIRCLE 107 ON READER SERVICE CARD



HAVE YOU TRAVELLED THIS ROAD TO CD-ROM NETWORKING AND MANAGEMENT? LET OPTI-NET® STRAIGHTEN YOU OUT.

New features include:

- New user request scheduling technique provides faster response
- New SCSI disconnect/reconnect feature greatly increases multi-disc access performance
- Remote network management tools to monitor and control the optical server from anywhere on the network
- Concurrent use enforcement to limit the # of users per database
- Centralized LAN management to eliminate user station installation and upgrades
- New log file to obtain valuable usage statistics

Novell® VAP version also available

OPTI-NET® is fully compatible with the IBM® ICLAS Classroom LAN Administration System and the Tandy® SchoolMate® network. Single and multiple CD-ROM units are also available.

ONLINE

Computer Systems, Inc.
Products Division
Sharing Information Through Technology™
20251 Century Boulevard, Germantown, Maryland 20874
(301) 428-3700 (800) 822-4004 FAX: (301) 428-3903

● PART OF REED INTERNATIONAL P.L.C.

ONLINE'S
PRODUCTS
DELIVER

IBM
Business
Partner

Novell
NetWare
Aware

these wonders only in exclusive company: It works on one network operating system and some SCSI boards.

MDI offers several versions of its software, including the \$295 *SCSI Express for DOS* (a nonnetworkable version), and versions for *LAN Manager 286* and *386* that are priced at \$1,295 and \$1,995, respectively. The *LAN Manager* product does not use NLMs, but MDI says it is designed to take as much advantage of that operating system as the Novell version does of *NetWare*. (The *LAN Manager* version in fact has few similarities with the *NetWare* product outside of its seamless and transparent integration with its network operating system.) For each operating environment, the software acts as an integration tool for eight different storage subsystems: CD-ROMs, WORMs, rewritable optical drives, multifunction drives, hard disks, tape backups, removable hard disks, and jukeboxes. After teaming the software with one of the bus-mastering Adaptec, AMI SCSI, or BusTek boards it supports, you can attach any combination of these subsystems to it. The product also supports the SCSI interfaces of the NCR 53C700 chip built into

**SCSI Express's use of
NetWare's cache
explains its phenomenal
performance on our
comparative tests; it
posted the fastest access
times on every test.**

NCR's latest 486 systems, as well as NetFrame and Tricord servers.

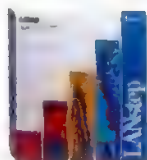
Although MDI could provide us only with its software and will sell the product by itself, the company encourages the purchase of complete packages containing the software, controller, and CD-ROM drives. A package consisting of *SCSI Express*, the Adaptec 1540 that we used in our test-bed, and a Toshiba CD-ROM drive sells for \$2,285.

With the *NetWare 3.x* version of *SCSI Express*, none of the workstations accessing a drive need to run any software locally. Instead, the tight relationship that *SCSI Express* for *NetWare 3.x* enjoys with its software host demands that they sit together on a file server with at least 4MB of RAM. This prime location perfectly positions the software to use *NetWare's* caching capabilities. Adding more memory to the amount of available cache improves performance; 8MB would be appropriate with five CD-ROM drives on the network, although the RAM you will need ultimately depends on network load. Unlike Corel Systems Corp.'s product, *SCSI Express* does not require a cache dedicated to CD-ROM use. When the cache is not required for CD-ROM purposes, the RAM is free to help performance in other areas.

SCSI Express's read-ahead buffer size of 16K is four times that of most of the redirectors, which also contributes to the product's fast times.

FASTEST ACCESS TIMES

SCSI Express's use of *NetWare's* cache explains its phenomenal performance on



Now there's a way to expand your networking capabilities without stretching your budget. LANstep™ from Hayes.

LANstep is easier to use than other LAN systems. All of its commands are

written in plain English, so you'll never have to learn complicated computer language. In fact, with LANstep's icon-based menu, most people can start working in just a few minutes. And LANstep is just as easy to manage, because it automatically builds and updates its own menus and directories.

LANstep is designed to grow with your business. You can add up to 128 active users or 255 workstations with our 5- and 20-step expander kits that take just 10 minutes to install.

And LANstep helps increase productivity with file, printer and application sharing. Its network-

Networking with our affor as it looks



CONNECTIVITY NETWORKING CD-ROMS

our comparative tests. Not only did *SCSI Express* post by far the fastest access times on every test, it allowed five workstations to access one drive simultaneously just as quickly as they could access five separate drives.

Installation is simple: It's just a matter of the administrator adding files into the server's *NetWare* directory. *SCSI Express* is more like an added subroutine word of code than a traditional "program." The distribution disk includes all the files required for the eight subsystems the program supports. The larger-than-needed number of files can be a boon. To add more storage subsystems, you only have to load the right device driver. The software can support up to 1,000 simultaneous users, depending on which version of *NetWare 386* it runs under.

Logging on to a CD-ROM is ridiculously easy with *SCSI Express*. After the program and the CD-ROM driver have been loaded, *SCSI Express* assigns logical names to all the drives based on their SCSI IDs. Each disk only has to be named once; the naming process retrieves the CD's volume ID and stores it on a SYS volume. The user merely mounts the CD

by its volume name and maps a local drive letter to it. The user then accesses the drive by typing in the drive letter at the DOS command line. Because our test-bed required us to use a number of disks with the same volume ID, the process was a bit more complicated, but MDI already had detailed the solution in its dry but thorough manual.

Unlike the other products in this review, *SCSI Express* does not support Microsoft's MS-DOS CD-ROM Extensions at all. Theoretically, this means that any CD-ROM program requiring MSCDEX will not work with this product. In practice, some CD-ROM applications that claim to require MSCDEX will work without it, such as National Geographic's *Mammals*. In other instances the user may be just out of luck.

NETWARE BINDERY INTEGRATION

Containing no security features of its own, *SCSI Express* relies on *NetWare* for security. *SCSI Express* can read the *NetWare* Bindery, from where you can set log-in names, passwords, groups, trustee

assignments, file attributes, and transaction-tracking systems.

The software comes with a 12-month warranty and is sold through dealers and VARs (value-added resellers). Technical support is available toll-free weekdays, 8:00 to 6:00 E.S.T., and through a BBS.

If you're a *NetWare 3.x* user, *SCSI Express* is the CD-ROM sharing software to buy. The *NetWare* version is so fast and comprehensive in its support of other storage subsystems that you even may find switching networks worthwhile.

ONLINE COMPUTER SYSTEMS INC. *Opti-Net*, DOS Version 1.3

by Kellyn Betts

Online Computer Systems' *Opti-Net*, DOS Version 1.3 CD-ROM networking program is a five-year-old offering that has some nice touches, but it could have aged more gracefully. Priced at \$795 for 8 users and \$1,495 for up to 100 users, *Opti-Net* demonstrated several flaws during our evaluation.

The most serious difficulty demon-

wide resource directories and broadcast features keep everyone up to date. Plus it allows for maximum hardware flexibility by supporting a variety of programs including: DOS, Windows,* and NetBIOS software, in addition to standard Ethernet, Token Ring™ and ARCNET adapter hardware.

While you might expect LANstep's advanced technology to be expensive, it's not. For just \$595 you can start with a 5-user network (that includes sophisticated electronic mail) and then continue to grow for as little as \$35 per workstation.

For more information about LANstep, call us at

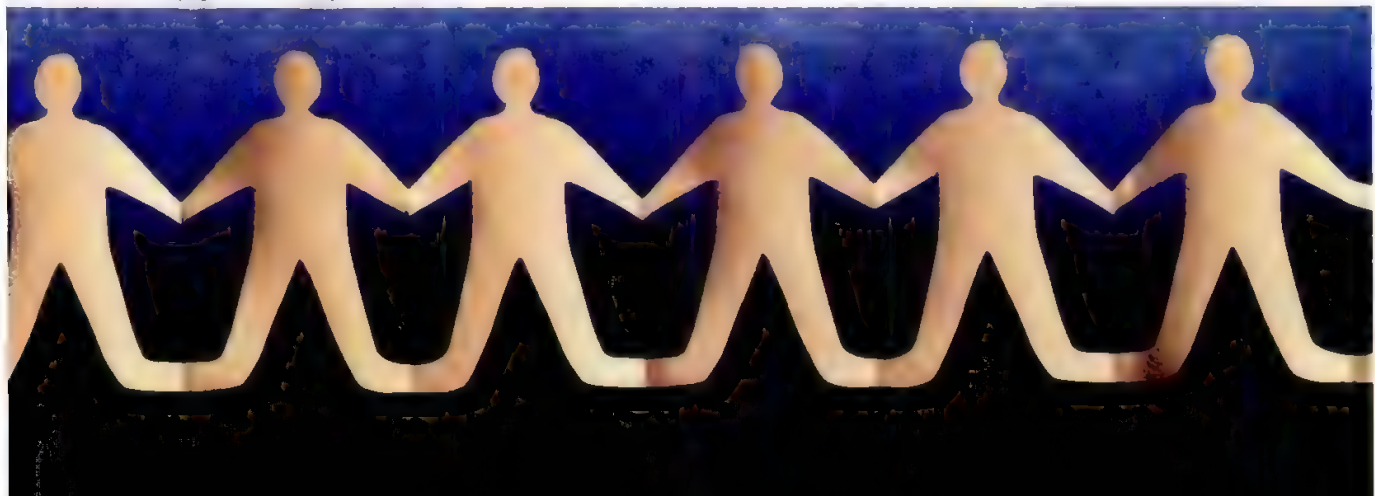
1-800-635-1225. And see what a little networking can do for your business.

CIRCLE 306 ON READER SERVICE CARD



Our technology has the computer world talking.
More than ever.

dable LANstep is as simple on paper.



© 1991 Hayes Microcomputer Products, Inc. P.O. Box 905000, Atlanta, GA 30308. All rights reserved. All trademarks are the trademarks or registered trademarks of their respective manufacturers.

ARTISOFT

Intelligent Solutions

LANtastic®

Artisoft IS... Networking

Our LanTastic® Network Operating System revolutionizes connectivity. It is cost effective, uses a small amount of RAM (as low as 12K per workstation, 40K per server) and is feature rich. Easy to install and easy to use, this award-winning product connects from 2 to 300 nodes per network – and will grow as you grow.

Artisoft IS... Ethernet

Artisoft Ethernet adapters are both affordable and flexible. Our AE-1/T™ 8 bit network interface card gives you full 10BASE-T connectivity for a low price. Our AE-2/T™ adapters offer two connections; thick coax or 10BASE-T. Then there's our AE-2™ adapter, thick or thin coax connectors. And our AE-3™ adapter *really* has you covered. Thick, thin or 10BASE-T, they're all on AE-3, Artisoft's most versatile 8/16 bit adapter. Artisoft Ethernet adapters also support a wide range of other LAN operating systems including Novell® NetWare®.

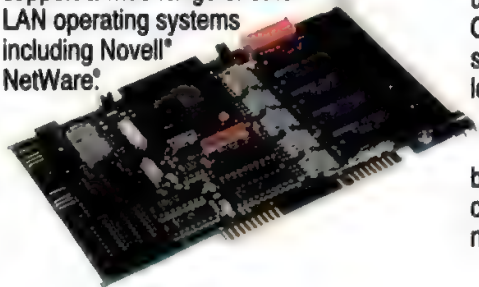


Artisoft IS... Connectivity Processing

The Central Station™ connectivity processor is Artisoft's open line to the network for instant laptop and printer connections. Winner of the 1991 COMDEX Best of Spring Award for connectivity, the Central Station processor is a platform for other possible future applications, including network print serving, dial-in modem access, CD-ROM and tape backup capability.

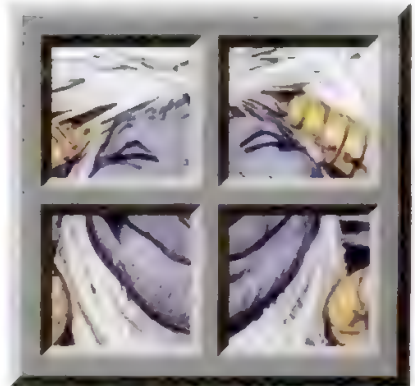
Artisoft IS... LANtastic for NetWare

This operating system provides Novell's NetWare users with the LANtastic network's peer-to-peer features, resource-sharing and flexibility. Overlays NetWare's centralized structure and administration to permit localized control and access to programs, data and peripherals such as printers, hard drives, tape backups and CD-ROMs, yet maintains connection to the dedicated server with no compromise in security.



Artisoft IS... LANtastic for Windows

Now you can transform the utilities in the LANtastic NOS into Windows' functional framework of pull-down menus, icons and on-line help. This lets you handle multiple tasks, monitor the queue of every printer-server on the network and text-chat with multiple users. Also works in the background while you run another Windows application.



Artisoft IS... Innovation

1992
- WINNER -
PC Magazine Award
for Technical Excellence



LANtastic Voice Adapter
Artisoft, Inc.



June 29, 1991
LANtastic, Version 4.0



ARTISOFT

Revolutionizing Connectivity

691 East River Road, Tucson, AZ 85704

Headquarters 602-293-4000

Sales/Technical Support 602-293-6363

Fax 602-293-8065

© 1991 Artisoft, Inc. All rights reserved. Artisoft, Artisoft, Inc., AE-1/T, AE-2/T, AE-2, AE-3 and Central Station are trademarks, and LANtastic is a registered trademark of Artisoft, Inc. NetWare is a registered trademark of Novell, Inc. LANtastic is a trademark of Microsoft Corp.

CIRCLE 254 ON READER SERVICE CARD



Opti-Net, DOS Version 1.3

Online Computer Systems Inc., 20251 Century Blvd., Germantown, MD 20874; 800-922-9204, 301-428-3700.

List Price: For 8 users, \$795; for 100 users, \$1,495.

Requires: Workstation with 256K RAM, DOS 3.1 or later, NetWare 2.12 or later or NetBIOS networks, CD-ROM server with 256K RAM, DOS 3.1 or later, CD-ROM drive(s).

In Short: Opti-Net takes the redirector approach to CD-ROM sharing but includes memory management features that reduce the memory load on workstations. It also has a convenient database-naming feature. The product has potential, but it still needs to be fixed in some places.

CIRCLE 608 ON READER SERVICE CARD

strated under NetWare 3.11 testing was Opti-Net's inability to allow more than three workstations equally quick access to shared CD-ROM drives, which the other products generally permit. Opti-Net provided unevenly distributed throughput when more than three workstations were accessing CD-ROM drives. Nevertheless, the software's access times were mostly average and still significantly faster than the slowest product in this review.

Online attributed the problem in throughput to a scheduling algorithm in its code. With a fix from the company, Opti-Net posted respectable times: speeds significantly above average and slightly below those of the fastest redirector. But we do not report those numbers in our test results, since the fix was not part of a shipping product. By the time you read this, the company says that the new, fixed version should be shipping.

Opti-Net also had trouble running with our Future Domain SCSI board. A special driver available from Future Domain solved the problem, but it was undocumented in the Opti-Net manual.

Online offers a VAP option called Opti-Net VAP, which sells for \$1,795 for a 100-user version on ISA-bus systems, and \$1,895 for MCA-bus systems. We didn't test it because it runs on NetWare 2.x and

No.	User name	Data base	Last operation	Status
1	Shirley's PC	Select	Server	0
2	Chris_300	DIP	Read data	0
3	Little John	Manual	NCCL input	0
4	Robin Reed	Manual	Server	0
5	Prater, Paul	Printer	Read data	0
6				
7				
8				
9				
10				

Opti-Net, DOS Version 1.3, saves workstation memory by having its user stations rely upon command-line connection demands. But the administrator is offered a wealth of TSR-activated screens to monitor the health of the connections that the software orchestrates, including this information-filled view of network status.

we used a NetWare 3.11 test-bed, but Online says this new product doesn't suffer from the difficulties that plagued the version we reviewed. It also contains security features not found in the software we saw. Opti-Net has few security features of its own; it does not allow the administrator to restrict database access to certain users.

LOGICAL DRIVE ACCESS

Opti-Net installs very easily on the workstation. By loading a 30K-plus TSR, users can access one CD-ROM drive, but they must give up 8K for each additional drive. A concept called *logical database access* allows supervisors to reduce the amount

run from a public directory on the network server. On NetWare networks, users need to run the NET.EXE shell, which takes up more memory. But this feature can potentially save a great deal of time with software updates, since the administrator never has to install or update the software on the individual workstations.

Opti-Net's attractive and otherwise thorough documentation describes an extensive selection of features, including the monitoring of CD-ROM usage and network statistics such as CRC errors, collisions, retransmissions, and number of received packets. The administrative character-based interface includes multiple screens for checking network status, monitoring database usage, and setting up drives. Administrators can also name a database: for example, "Parts." This lets users send a command via the DOS command line and open the database by name instead of having to remember which drive letter it's mapped to. Users can access a single database that spans several drives.

Online offers free technical support at a toll-free number weekdays from 9:00 to 5:00 E.S.T. By the time this review comes out, all the updates and improvements discussed here should be available on the Opti-Net distribution disk and documented in its manual. For those who want to go the redirector route to CD-ROM sharing, the new version will transform a fairly reasonable but dated product into a really good, well-aged one. ■

Opti-Net's thorough documentation describes an extensive selection of features.

of memory that Opti-Net takes up by requiring users to specify the maximum number of drives they will need to access. If seven drives containing sets of three CDs and four CDs are connected to the server, users can specify four as the maximum number of drives required and still get access to both sets for 54K. Online also offers an as-yet-undocumented piece of software that will unload the workstation TSRs from memory when coupled with a third-party TSR memory manager.

Another undocumented but not unusual feature is that all of Opti-Net can be

Angela Gunn is an editorial assistant at PC Magazine. Kellyn Betts, Greg Pas-trick, Ed Perratore, and M. Keith Thompson are frequent contributors to PC Magazine.

NOBODY DOES IT BETTER.



"The Norton Utilities 6.0 gives serious power users everything they need in a DOS utility. It's clearly the only choice."

—Peter Norton

INTRODUCING THE NORTON UTILITIES™ 6.0.

For the ultimate in DOS® performance, nothing compares to the Norton Utilities 6.0. Because the Norton Utilities 6.0 provides the most sophisticated data recovery technology you can buy.

The Norton Disk Doctor®, UnErase®, UnFormat, and File Fix now work on larger disks and solve more disk errors automatically. UnErase even offers 100% recovery of network files using Erase Protect.

INFOWORLD Utilities Product Review*:

Norton Utilities 6.0	8.5
PC Tools 7.0	7.1

And according to PC Magazine, our "unique Disk Editor makes Norton the best single package for data recovery."[†]

What's more, the Norton Utilities 6.0 comes with NDOS—the ultimate DOS enhancement. NDOS combines the power of the command line with the flexibility of a DOS shell. It also reduces your DOS memory requirement up to 5K—yet adds over 200 powerful command line options. Including an extended batch language, longer file name descriptions, plus command line history, editing and audit trails. And of course, NDOS works with networks, Windows, and all versions of DOS.

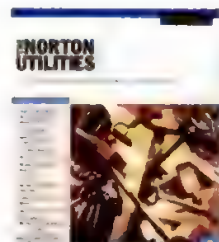
The Norton Utilities 6.0 even keeps your hard disk tuned for high performance. Speed Disk now defragments your disk four times faster than before. Plus the new Norton Cache—a Windows 3.0 compatible SMARTDrive replacement—delivers disk speeds unmatched by any other DOS or Windows utility. And Calibrate™ adjusts your

Power Features

- Takes full advantage of DOS 5.0
- NDOS—The Complete DOS Enhancement
 - File name descriptions up to 40 characters long
 - Faster, more powerful batch files
 - Command Line History, Editing and Audit Trails
 - Reduces the amount of memory required by DOS, yet adds over 200 command line options
- Speed Disk is four times faster than NU 5.0
- Faster Norton Cache for DOS and Windows
- Directory Prune and Graft on networks across drives
- Enhanced Directory Sort, Text Search File Attributes, File Date, File Size, and Line Print
- Full Screen and Quick Command Line Operation

interleave for even more speed and reliability.

So see your local dealer today and pick up a copy of the Norton Utilities 6.0. Or call **1-800-343-4714, Ext. 734P** for more information. It's the best way to achieve your highest system performance ever.



SYMANTEC.

CIRCLE 344 ON READER SERVICE CARD

© 1991 Symantec Corporation. All rights reserved. The Norton Utilities is a registered trademark of Symantec Corp. Other brand or product names mentioned are trademarks of their respective holders. *INFOWORLD, July 15, 1991. †PC Magazine, September 10, 1991.

by
Douglas Boling

Utilities

Do you ever go out to the DOS prompt rather than wrestle with the *Windows* File Manager? Bloated and ponderous, the File Manager is a pain to use, but until now you may have had no GUI-based alternative. Now you've got WINNAV.

Short for *Windows Navigator*, WINNAV is a compact, easy-to-use file manager that will quickly pilot you through the countless directories on your hard disk. It provides all the services you'd expect: opening files and launching applications; moving, copying, renaming, deleting files and directories; providing full file information and setting file attributes. It's compatible with all three (Real, Standard, and 386 Enhanced) *Windows* 3.0 modes. And like all good *Windows* programs, WINNAV can be configured to your liking.

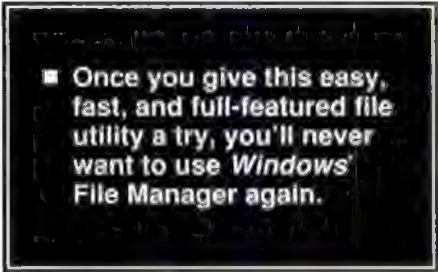
You can download a copy of WINNAV.EXE, together with its C source code and related resource files, from PC MagNet, as explained on the PC MagNet News page, which follows this article. In case you don't have a modem, the source code is available by mail or fax: Just send a *postcard* with your name and address to the attention of Katherine West, Utilities, *PC Magazine*, One Park Ave., New York, NY 10016. To compile the program you'll need Microsoft C 6.0 and the SDK.

USING WINNAV

The easiest way to learn WINNAV is to run it. You can load the program with the File Run command from the Program Manager, or you can create an icon in the Program Manager window. To do the latter, simply select File New, Program Item, and then enter a description and path for WINNAV.EXE. Or, to avoid typing, select Browse and search your directories until you find WINNAV. Click on it and it will automatically be entered on the command line.

Once started, WINNAV brings up a window containing a number of list boxes. Just how many boxes are displayed simultaneously depends on the number of pixels on your screen and on the size of

WINNAV.EXE Manages Your Files Under Windows



■ Once you give this easy, fast, and full-featured file utility a try, you'll never want to use *Windows* File Manager again.

your *Windows* system font. As shown in Figure 1, a typical VGA setup will show a total of four boxes, but to accommodate ultra-high resolution monitors, WINNAV can produce as many as ten.

The thin box on the left always lists the available drives, with the current drive highlighted. The remaining, wider list boxes hold the names of the directories and files on the selected drive. If you highlight a directory, the box to its right will immediately display the subdirectories and filenames in that directory. Highlight one of these subdirectories, and the process repeats itself in the next box to the right until you reach the subdirectory level you want.

If the default path contains more directory levels than there are list boxes available to show their contents, the highest-level directory/filename list box will automatically scroll off-screen when you open up a new listing by highlighting a subdirectory. At any time, however, you can restore the display of off-screen columns by using the horizontal scroll bar beneath the list boxes. The Tab key will take you from one list box to another if you're not using a mouse.

WINNAV can be maximized to fill the entire screen or minimized down to its

File Drawer icon. When you resize the WINNAV window to an intermediate size, the display automatically reconfigures itself, again to display the maximum number of list boxes possible.

Menu bar functions that operate on files or directories are listed in the Files menu. The Help menu contains only one menu item, which displays the obligatory About WINNAV box. The View menu option brings up the Configure... menu, which is shown in Figure 2. Selecting this item allows you to set the WINNAV defaults and customize both the number and the functions of the buttons seen in the column to the right side of the list boxes.

The buttons provide one-click execution of the functions available through the menu bar. As detailed below, up to ten function buttons can be displayed. In addition to the six default buttons shown in Figures 1 and 2, you can add buttons to display file information, set attributes, exit, and bring up the configuration menu itself. On the other hand, if you want to free up more screen space for another list box, simply select View Configure and enter 0 for the Num of Buttons item. Any button can be assigned to any WINNAV function, and however the buttons are configured, all functions remain accessible through the menu bar.

You can open a selected data file with the Open button, from the File Menu selection, or by double-clicking. WINNAV immediately looks at the WIN.INI association table to see whether you have associated the file extension with a particular application. If so, that program will be launched and will open the high-

Utilities

lighted file. If there is no association, WINNAV tries to open the data file with NOTEPAD.EXE, its default editor. Through the configuration dialog box you can change the default editor to any DOS or Windows program that will accept a filename on its command line.

A highlighted program file can be launched on its own from the File Menu, by double-clicking on it, or by hitting the Run button. WINNAV determines that the file is a program by comparing the extension with the Programs entry in WIN.INI. When the current selection is a directory instead of a file, the Open menu option and its corresponding button are disabled.

The Copy function operates on either files or directories. Select Copy and a dialog box opens. Here you can enter the destination information by typing on the command line or by selecting a directory or file from the list boxes. In this and in all appropriate WINNAV dialog boxes, the Tab key will move you among the items with which you can interact, should you prefer this to using a mouse. If you're copying a file, you can change the name applied to the copy. If a directory is selected, WINNAV copies all the files in the directory under their same names, but it gives you the option of including or excluding any subdirectories. And then you hit Enter or click on OK.

The Delete function also works on either individual files or on directories. If a directory is selected, all files and subdirecto-

ries in the directory are deleted and the directory is removed. To prevent accidental deletions, a dialog box asks you to confirm the delete. The confirmation dialog box can be disabled from the configuration dialog box.

Move combines the Copy and Delete functions. As with the Copy function, WINNAV can move either individual files or complete directories. In addition, you can type the destination information or select a file or directory from the list boxes.

Each time you start it,
WINNAV creates a
window of the same
size and position as
when you last exited it.

The Rename function can also be applied to the currently selected file or to a directory. If you Rename a directory, only its name, not its contents, is affected. You should be careful not to Rename directories with executable files in them unless you intend to fix any paths used by the Program Manager to launch files. To change the paths, select the program in the Program Manager, then select the Files Properties menu item. From there, you can enter the new name of the directory containing the program.

The Attrib function lets you modify the Archive, System, Hidden, and Read-Only attribute flags of your current selection. When this function is activated, a dialog box comes up that displays the current settings and provides check boxes for modifying them.

The Mkdir option lets you create a directory on another drive or add a directory to the current path. For the former, simply select Mkdir and enter the full path specification. For example, if you're in D:\WIN and you want to create C:\PCMAGUTILS, simply type the latter on the command line. To add a directory to your current path, however, simply enter the name of the directory. For instance, if you're in D:\WIN and you want to create a subdirectory WINUT, enter WINUT on the command line.

The Info button (or Properties item from the File Menu) opens a dialog box that displays the name, file type, file size, attribute status, and the date and time the file was last modified.

The Config function, accessed from the View Menu, lets you customize WINNAV's operations. Here you can individually disable the default file delete and directory delete confirmation, select whether you want hidden and/or system files shown, and choose whether you want directories listed before or after files in the list boxes. Here also you can configure the buttons and provide an alternative filename for the default editor or application. As before, the Tab key will take you among the selectable items and the Enter key will register your selections if you find this easier than using a mouse.

All configuration data is saved in a file called WINNAV.INI. WINNAV reads this file each time it is launched. When you select the Exit function, the current size of the window is also saved to WINNAV.INI. This way, the next time WINNAV is launched, the program will create a window of the same size and in the same position as well as with the previous configuration settings.

PUTTING THE CHILDREN TO WORK

To fully appreciate the discussion of the programming embodied in WINNAV, you should obtain a copy of its source code. For beginner and expert alike, the definitive text on both the basics and the intricacies of Windows programming is *Programming Windows* by PC Magazine contributing editor Charles Petzold.

As with all Windows programs, WIN-

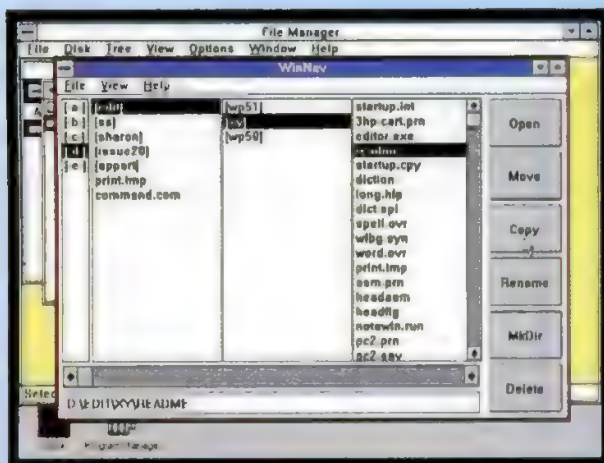


Figure 1: On a typical VGA, WINNAV shows drive, directory, and filenames in four boxes. It also automatically scrolls to accommodate many layers of subdirectory levels. The buttons on the right allow instant command execution.

Utilities

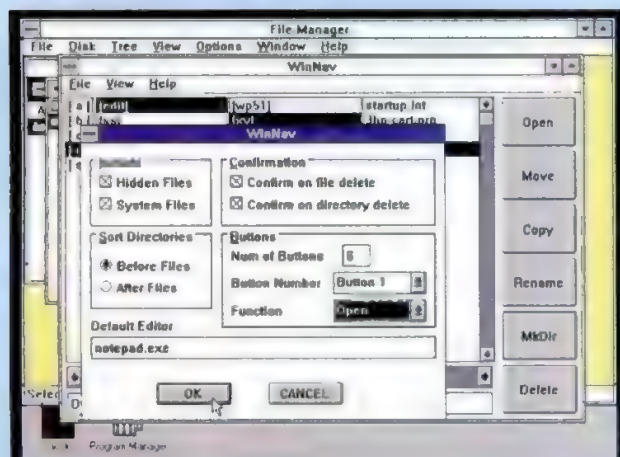


Figure 2: Accessible through the View menu, the Configure... dialog box lets you customize button functions and other WINNAV default settings.

NAV is designed around a window procedure that intercepts and interprets messages from the *Windows* system code. These messages signal WINNAV that an event—such as a keypress or a window resizing—has taken place. All messages not processed by WINNAV are passed to the default window procedure, and WINNAV actually looks at only 6 of the more than 125 documented messages *Windows* sends to the client window procedure. WINNAV's real work is carried on by a number of child windows created by the client window.

On start-up, WINNAV performs the standard *Windows* litany of registering a window class, creating a window, and entering the message loop. The only other function of the *WinMain* procedure is to read the saved configuration data from the WINNAV.INI file.

Saving and reading configuration data is simplified by the profile data functions provided by *Windows*. Integers and strings can be stored and recalled from configuration files that bear the customary .INI extension. WINNAV follows the recommended *Windows* programming practice of using a private configuration file instead of the much more public WIN.INI file.

Once the configuration data is read and the client window created, activity switches to the window procedure, *WndProc*. *WndProc* is composed of a switch statement to parse the desired *Windows* messages.

The first message *WndProc* receives

is the WM_CREATE message that is sent immediately following the creation of the window. At this time WINNAV performs all of the setup functions needed for the window.

The WM_CREATE code's first task is to determine the size of the child window controls. The window size must be computed for each system, since the system font sizes vary across different video cards. To determine the system font size, WINNAV uses the *GetTextMetrics* call to *Windows*.

Next, WINNAV registers the entry points

WINNAV's real work is carried on by a number of child windows created by the client window.

into the program for the various dialog procedures and subclass functions. All entry points that *Windows* calls must be registered this way. The entry point for the client window, *WndProc*, was automatically registered when the window class was registered. This registration is accomplished with the *MakeProcInstance* call.

Once this is accomplished, the child

windows can be created. *CreateWindow* is called for the edit control, the scroll bar, the drive list box, and for each of the directory list boxes and buttons. As the edit control and the list boxes are created they are *subclass*d. This facilitates keyboard navigation, as I will discuss a little later on.

Once the child windows are created, the list boxes must be filled with information. Starting from the left, each list box is to be filled with the contents of the individual directories on the current path. When a directory is selected, the list box to its immediate right is to contain the contents of that directory.

The powerful LB_DIR message, which instructs the list box to fill itself with the names of files that are contained in a given directory, is used to fill each list box. The search criteria can be modified to include files with specific attributes, and both drive and directory information can be included in the list box. WINNAV actually sends two LB_DIR messages, differing only in search criteria, to each list box. One message is used to add directories to the list box, the other to add files. This allows the files and directories to be conveniently grouped.

Since the number of list boxes in use can vary from 1 to 10, WINNAV was written in such a way as to isolate the specific list box handles from the code that manages them. All messages that are sent to the list boxes are sent from the *SendListBoxMessage* function. This function determines whether the specific list box actually exists in the WINNAV window. If the list box doesn't currently exist, the necessary information is parsed from the message and stored. If the list box is ever created, the information is then sent to the newly created list box.

The number of list boxes on-screen at one time is determined by the size of the WINNAV client window. As the size of the window is changed, the number of list boxes necessary must be recomputed. *Windows* conveniently notifies programs when the size of a window is changed by sending its WM_SIZE message.

WINNAV checks for the WM_SIZE message to monitor the size of the window continuously. If the window grows large enough to hold another list box, the box is then created. Conversely, if the window shrinks, the number of list boxes is reduced using the *DestroyWindow* call. Most of the WINNAV code is completely oblivious to the actual number of list boxes

PC MAGAZINE UTILITIES UPDATES

As with all good software, the programs presented in *PC Magazine* are upgraded and improved. You can get the modified versions by downloading them from PC MagNet. Here's a partial list of the programs that have been upgraded to fix minor bugs and system incompatibilities:

ANSI.COM, Version 1.3
BAT2EXEC.COM, Version 1.3
BCOPY, Version 1.2
BEN56.ARC (Benchmark Series, Version 5.6)
CARDFILE.COM, Version 1.1
CHKFRAG.EXE, Version 1.2
CMDEDIT.EXE, Version 2.1
CONFIG.CTL, Version 3.0
DIRMATCH.COM, Version 2.0
EMMA.COM, Version 2.2
EMS40.SYS, Version 1.1
PANDORA.COM, Version 1.5a
PCACCESS.COM, Version 1.1
PCMANAGE.EXE, Version 1.1
PCREMOTE.COM, Version 1.1
RN.COM, Version 2.0

SCHEDULE.COM, Version 1.1
SLICE.COM, Version 1.3
SNIPPER.COM, Version 1.2
TPFST-AT.COM, Version 1.1
ZCOPY.COM, Version 1.2

If you'd like a complete list of all the programs available from the PC MagNet Software and Utilities Database Library, simply download PCMCAT.ARC.

A downloadable index to *PC Magazine's* product reviews is also available. PCM.EXE is a self-extracting file that contains the *Computer Library PC Magazine Reviews Index* for January 1988 to June 1991. It requires the search files in PCSRCH.EXE. Please read the information file PCM.INF before you download any of these files.

These programs are copyrighted. You may make copies for others as long as no charge is involved. However, making copies for any commercial purpose is prohibited. ■

because of the list box virtualization.

The length of the list boxes and the size of the buttons is also affected by the size of the window, whose upper-left corner provides the origin for the *Windows* coordinate system. To keep the edit control and scroll bar in position relative to the bottom of the window, they too must be moved each time the window is resized. The height of the list boxes is then adjusted to fill the space between the top of the window and the scroll bar. WINNAV uses the SetWindowPos call to move and resize the child windows.

The WM_COMMAND message notifies a window that a menu item has been selected, an accelerator key has been pressed, or a child window has sent notification of an event. WINNAV parses this message for all three types of notification.

When the user selects the File Open option, *Windows* sends the corresponding WM_COMMAND message with the wParam parameter equal to the number associated with the Open menu entry in the WINNAV menu resource. WINNAV responds to this notification, and subse-

quently responds to the input from the user.

To open a file, WINNAV first searches the Programs variable in the [Windows] section of the WIN.INI file for a matching file extension. This variable usually consists of the familiar .EXE, .COM, and .BAT extensions. *Windows* can also add other extensions to the Programs line, however; Multimedia *Windows* adds the .SCR and .CPL extensions, for example. If an extension is found, the file is considered a program and is launched using the WinExec call. If the extension is not found, the file is assumed to be a data file.

To open a data file, WINNAV first searches the [Extensions] section of WIN.INI. If the extension of the file being opened is found, WINNAV uses the GetProfileString function to copy the corresponding string from WIN.INI. The string corresponds to the name of the program used to open the file. WINNAV replaces the ^ symbol in the string with the fully qualified name of the file to be opened. The application is then launched using the WinExec function.

If a matching extension is not found in WIN.INI, WINNAV uses the name of the default editor (or other application) that appears in the configuration dialog box. This program is also launched using WinExec with the fully qualified name of the selected file as the only argument.

When the File Copy command is selected, a dialog box must be presented to query the user for the destination disk, directory, and if necessary, the filename. WINNAV then determines whether the selected name is a file or directory.

If a file has been selected, WINNAV simply calls the CopyFile routine to copy the file. The CopyFile routine opens the source file, requests a block of memory from *Windows*, reads the data from the source file, then writes it into the destination file. If the source file is larger than 64K, CopyFile continuously loops through the lock memory/read file/write file/unlock memory loop until the file is completely copied.

If a directory was selected, WINNAV calls the CopyDir routine, which searches the directory for files and directories. Subdirectories are copied by calling the CopyDir routine recursively.

Files are deleted in a similar manner. WINNAV first determines whether the selected name is a directory or a file. To delete directories, the DeleteDir routine is called. This routine recursively calls itself to delete any subdirectories of the directory to be deleted. If the selection is a file, the DeleteFile routine is called instead. WINNAV uses the *Windows* OpenFile function with the OF_DELETE and OF_EXIST flags to remove the file.

The Move command is simply a combination of the Copy and Delete commands. First, the CopyFile or CopyDir routines are called. If the copy is successful, the proper delete routine is called to delete the source files.

The Rename command operates only on an individual filename or directory name. If a directory is selected, only the name of that directory is renamed; the files in the directory are unaffected.

The Attrib command simply displays the Set Attribute dialog box; the work of changing the file attribute flags is done in the dialog procedure. The Set Attribute dialog procedure uses the Microsoft C 6.0's _dos_getattr and _dos_setattr library routines. These routines, along with standard check box dialog controls, make setting file attributes a simple matter.

The File Properties function launches

Utilities

a dialog box to display the file information. The information displayed in the dialog box is obtained using the `_dos_findfirst` library call. The dialog box simply sets a number of static text controls in the dialog window to present the data.

The View Configuration command presents a dialog box to query the user on the configuration of the window. While the Config dialog procedure is the most intricate of WINNAV's many dialog procedures, it remains a relatively straightforward procedure.

The most complex aspect of the Config dialog procedure is the work needed to select the function of the buttons on the client window. The function selection is handled by two combo boxes, the first of which selects the button to change, the second being used to select the function for the button.

When a `WM_COMMAND` message is sent to the Config dialog procedure indicating a change to the button selection combo box, the dialog procedure selects the proper function from the list contained in the button function combo box. When a different function is selected, the new function is recorded in an array that keeps track of each button's function.

When a `WM_COMMAND` message with an `IDOK` identifier is received (indicating the user pressed the OK button), the Config procedure reads the status of each of the controls. The state of each of the check boxes indicates the state of the configuration flags for such items as delete confirmation and directory positioning. The data from the local button function array is copied into the button structure. The procedure then calls the `EndDialog` function to terminate the dialog.

The buttons on the right side of the window also return `WM_COMMAND` messages to the client window. The logic for parsing the button clicks is actually deceptively simple. When a `WM_COMMAND` message indicates that the user has clicked on a button, the ID code of the button is used as an index into an array. This array contains the ID of the equivalent menu item for the button function. The client window simply sends itself a `WM_COMMAND` message containing the ID of the menu item, thus simulating a menu selection. The `WM_COMMAND`

menu message is then parsed as if the user had selected the menu item instead of clicking on a button.

When a user selects an item in one of the list boxes, a `WM_COMMAND` message is sent with a `LBN_SELCHANGE` notification. WINNAV responds to this message by building a new path from the current selections in the list boxes. The way in which the path is built is best conveyed by example. If a user selects the C: drive in the drive list box, WINNAV fills the first list box with the contents of the root directory of the C: drive. If the user then selects the FILES directory in the first list box, WINNAV determines the selected drive (still C:) from the drive list box, appends \FILES to the path, then fills the second list box with the contents of the C:\FILES directory. If the user selects the BACKUP directory in the second list box,

The trick that WINNAV uses to intercept keystrokes before the child windows see them is known as subclassing.

WINNAV builds the path by getting the selected drive from the drive list box, getting the \FILES directory from the first list box, getting the BACKUP directory from the second list box, and filling the third list box with the contents of the C:\FILES\BACKUP directory. Each time a directory or file is selected, WINNAV rebuilds the path by querying the selected items in the list boxes.

When a `LBN_DBLCLK` notification is received, WINNAV determines whether the selected name is a program or a data file. If it's a program, WINNAV sends a `WM_COMMAND` message to itself to simulate a File Run menu pick. If the item is a file, a File Open menu selection is simulated with a message.

THE KEYBOARD INTERFACE

WINNAV's keyboard interface is more difficult than you may think at first. *Windows* sends `WM_CHAR` messages to the

focused window when keys are pressed. The problem is that WINNAV keeps the focus on the child windows, not on the client window. Since each of the child windows deals with keystrokes in its own way, WINNAV must be able to intercept the keys before the child windows see them. The trick used to intercept the messages is known as *subclassing*.

The controls for all windows operate through window procedures. When a window is subclassed, all messages to that window are sent to the subclass procedure rather than to the registered window procedure. This provides a way to override the normal window procedure action. The subclass procedure is responsible for passing the message to the original window procedure. A subclass procedure is similar to a standard window procedure with the exception that messages are passed to the old window procedure instead of the default window procedure.

WINNAV subclasses two of the control types it uses: the list box and the edit control. The list box is subclassed to intercept the Tab and Enter keys. The Tab key is used to change the focus window from the current list box to the list box on the immediate right. The Enter key is parsed to simulate a double-click of the mouse, indicating that the selected file should be opened or launched.

The edit control is subclassed to parse the same two keys, Tab and Enter. The Tab key changes the focus window among the various user-selectable options. The Enter key is used to indicate that the user has changed the contents of the edit box and that the text must be parsed into a filename.

WINNAV demonstrates the power of the controls already provided by *Windows*. Programmers who take advantage of these controls can enhance the functionality of their programs while still retaining the standard user interface and look of traditional *Windows* programs.

As we look into the future, however, the standard controls provided by *Windows* are only a precursor to a new wave of reusable blocks of self-contained code. In future systems, these objects will be used as standard building blocks for more-than-standard interface components. This is an exciting prospect for *Windows* programmers. ■

Douglas Boling is a contributing editor of PC Magazine.



PC MagNet News

The Latest Files and Features of PC Magazine's On-line Service

Top Ten ASP Programs Now in SOFTLIB

From its inception, the Software and Utility Library (SOFTLIB) has been the place to find *PC Magazine* utilities and files. Over the last few months we've expanded SOFTLIB and added program files from other Ziff-Davis publications including *PC/Computing*, *PC Week*, and *Computer Shopper*.

In addition, SOFTLIB now features ASP's Top 10. In our March 26, 1991, column, we told you that we had devoted two Forum Libraries to the programs offered by the Association of Shareware Professionals (ASP). Now, its 10 best-selling shareware titles in North America and Australia

are also available in SOFTLIB. This service is courtesy of Public Brand Software; we will be working with Public Brand in the coming months to bring its entire shareware catalog and reference guide on-line. Public Brand's catalog, well-known for its large collection of high-quality software, will almost double the number of programs already offered in SOFTLIB and will complement them well.

To get to the Software and Utility Library, just type GO SOFTLIB at any prompt. To find the Top 10, simply choose 5 (Download the latest files), and then 3 (ASP Top Ten List).

Major Upgrade for Pandora

Version 2.1 of PANDORA, a script language utility that made its debut in the Utilities column, May 15, 1990 (originally called PAN), is now available in PC MagNet's Util section as PANDOR.ZIP. PANDORA is similar to other script languages in that it lets you build scripts to customize and automate your programs. Most script languages are application-specific (for example, *ProComm*); PANDORA, however, works with many text-based applications.

Pete MacLean has enhanced many of PANDORA's features as well as added new commands. For example, PANDORA's easy-to-use scripting language now gives you even greater control over your applications and display, which is particularly important if you're using PANDORA to create an unattended demo. And it lets you quit a program

you executed from within PANDORA and run another one.

ScreenWrite and ScreenRead are two new commands that save and restore screen images, allowing you to create slide shows and other applications.

Older commands, such as GetKey, have also been upgraded and enhanced with new commands such as WaitKey. WaitKey permits you to make entries in PANDORA while a child program continues to run. It also means you can interact with software while it's being invoked by the script. There were a few programs that earlier versions of PANDORA didn't work with, most notably *WordPerfect*; the BIOS Enhanced Keyboard Services are now supported.

To access PC MagNet's Util Section of the Utilities/Tips Forum, type GO ZNT: TIPS.—Chris Parker

- **TOP ASP PROGRAMS NOW IN SOFTLIB:** Thanks to Public Brand Software, the Software and Utility Library is growing.
- **MAJOR UPGRADE FOR PANDORA:** Our versatile, easy-to-use scripting language has been enhanced by its author.

Instant Access to PC Magazine's On-line Service

PC Magazine operates a 24-hour-a-day interactive dial-up service where readers can find the utilities published in every issue, download an index of all product reviews, share opinions with the editors, and gain access to Computer Library and Consumer Reference Library.

How to Subscribe Right Now!

You can join PC MagNet with one phone call

1. Choose a phone number by following the directions under "Finding the Number in Your Town" (below)
2. Set your communications software to 300, 1,200, or 2,400 bits per second, 7 data bits, even parity, 1 stop bit, and full duplex
3. Dial the local number. When you connect, type Ctrl-C
4. At the HOST NAME prompt, type CIS.
5. At the USER ID prompt, type 177000,5000.
6. At the PASSWORD prompt, type PC*MAGNET.
7. At the ENTER AGREEMENT NUMBER prompt, type Z10D9100.
8. Register your name and enter your MasterCard, Visa, or American Express card number. (If you'd like to have your company billed instead, call CompuServe at 800-848-8990.)
9. Your personal User ID and Password will be displayed at the end of the registration process. Record them for logging on over the next few days; a new password will arrive in the mail within ten days to confirm your subscription.

There are no up-front subscription charges; you pay only for the time you spend on-line. CompuServe members can join by entering GO PCMAG at any CompuServe "I" prompt. CompuServe Customer Service can be reached at 800-848-8990. Outside the United States call 614-457-8650.

PC MagNet costs \$12.80 an hour for 1,200- or 2,400-bps service, or \$6.30 an hour for 300-bps service. Billing is based on 1-minute increments.

Finding the Number in Your Town

Using your modem: Dial 800-346-3247. When the modem connects, press Enter. At the HOST NAME prompt, enter PHONES. Follow the menus and note the number closest to you.

Using voice: Dial 800-635-6225. Follow the instructions and note the number.

by
Charles Petzold

Environments

A digital tape recorder is perhaps the best simple application for demonstrating the waveform audio interface of the Multimedia Extensions to *Windows*. Such a program can record sound through a microphone, store the sound in a binary form in memory or a file, and later play it back, perhaps after some editing or other manipulation.

The Multimedia Developers Kit (MDK) includes a program called WAVEEDIT that does precisely this. It records, it plays back, it can store sounds in files and load them back into memory. WAVEEDIT even displays the sound wave in a graphical format and lets you perform cut-and-paste operations on it.

The program I'll be showing in this column (called RECORD1) isn't quite as sophisticated as WAVEEDIT. It doesn't do any file I/O or allow sound editing. However, it does demonstrate the basics of using the so-called low-level application programming interface (API) to the waveform audio facilities. This API is built around the functions beginning with the *waveIn* and *waveOut* prefixes we looked at in the last issue.

TAPE RECORDER PUSHBUTTONS

Like the SINEWAVE program I discussed in the November 26, 1991, issue, RECORD1 uses a dialog box created as a main window. The window has eight pushbuttons, as shown in Figure 1. The first time you run RECORD1, only the Record button is enabled. When you press this button, you can begin recording. The Record button becomes disabled and the End button is enabled. You press End to stop recording.

At this point, the Play, Reverse, Repeat, and Speedup buttons also become enabled. Pressing any of these buttons plays back the sound: Play plays it normally, Reverse plays it in reverse, Repeat causes the sound to be repeated indefinitely (like a tape loop), and Speedup plays the sound back at twice the speed. You can end playback by pressing the

Exploring Waveform Audio: Building a Digital Tape Recorder

■ A sample program demonstrates the basics of using the low-level application programming interface to Multimedia *Windows*' waveform audio facilities.

second End button, or you can pause the playback by pressing Pause. When pressed, the Pause button changes into a Resume button to resume playing back the sound. If you record another sound, it replaces the existing sound in memory.

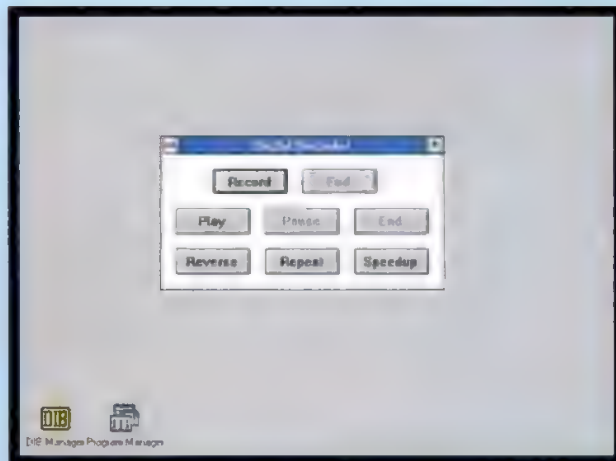
At any time, the only buttons that are enabled are those that perform valid

operations. This requires a lot of calls to *EnableWindow* in the RECORD1 source code, but the program doesn't have to check if a particular pushbutton operation is valid. Of course, it also makes the operation of the program more intuitive.

RECORD1 takes a number of shortcuts to simplify the code. First, if multiple waveform audio hardware devices are installed, RECORD1 uses the first one. Second, the program records and plays back at the standard 11.025-kHz sampling rate with an 8-bit sample size even if a higher sampling rate or sample size is available. The only exception is for the speed-up function, where RECORD1 plays back the sound at the 22.050-kHz sampling rate, thus playing it twice as fast and an octave higher in frequency.

RECORD1 uses a huge (greater than

Figure 1: The pushbuttons in RECORD1 perform common tape recorder functions.



SPUR YOUR PRODUCTIVITY!

ANNOUNCING

COMPUTER SELECT™

The Most Complete
Database of Computer
Product Information
Available

Get instant access to more than...

- ✓ 70,000 articles and abstracts from over 140 leading publications
- ✓ 70,000 hardware, software and communications product specs
- ✓ 12,000 company profiles, including addresses and phone numbers
- ✓ 9,000 definitions of computer and telecommunications terms.

With COMPUTER SELECT, you'll never again risk making the costly mistake of acquiring the wrong product. Now, using your own PC, you can identify, evaluate and select the best products that meet your requirements and your budget. Easy-to-use search software lets you quickly retrieve the documents you need from the vast database of product reviews, specifications, announcements and buyers guides.

And now COMPUTER SELECT incorporates all the reference information from Data Sources®, the leading computer industry directory. You'll find specs for over 70,000 hardware, software and data communications products — plus profiles of the 12,000 companies that make the products you want.

See results in less than one hour

New users are doing productive work in less than one hour. No installation is needed. Just pop in the CD-ROM disc and a few simple steps locate, retrieve and print the information you want. And a new, updated disc is sent to you each month so you'll always have current product information.



CALL NOW FOR A FREE DEMONSTRATION DISK

212-503-4400

COMPUTER

LIBRARY

Computer Library and Computer Select are trademarks and Data Sources is a registered trademark of Ziff Communications Company. © 1991 Ziff Communications Company

CIRCLE 158 ON READER SERVICE CARD

Environments

RECORD1.MSC

COMPLETE LISTING

```
#-----#
# RECORD1.MSC make file for Microsoft C 6.0
#-----#

record1.exe : record1.obj record1.def record1.res
             link record1,, NUL, /nod alibcew libw win87em mmsystem, record1
             rc -t record1.res

record1.obj : record1.c record1.h
             cl -c -G2sw -Ow -W3 -Zp record1.c

record1.res : record1.rc record1.h
             rc -r record1.rc
```



Figure 2: This is a Make file for the Microsoft C 6.0 Compiler and Windows Software Development Kit (SDK).

RECORD1.BCP

COMPLETE LISTING

```
#-----#
# RECORD1.BCP make file for Borland C++ 2.0
#-----#

record1.exe : record1.obj record1.def record1.res
             'tlink /c /n /Tw /Lc:\borlandc\lib c\ws record1, record1, NUL, \
             /nod cwins cs import maths mmsystem, record1
             rc -t record1.res

record1.obj : record1.c record1.h
             bcc -c -w-par -W -2 record1.c

record1.res : record1.rc record1.h
             rc -r -ic:\borlandc\include record1.rc
```



Figure 3: Use this Make file with the Borland C++ 2.0 Compiler.

64K) memory block for storing the sound. This memory block is dynamically re-allocated during recording. Because huge memory blocks require segment selectors in particular increments, it may not be possible to use all of system memory for the sound storage. I have 8MB in my machine, and under Windows Enhanced mode, I usually can't store a sound greater than about 2MB in length. At the 11.025-kHz sampling rate with 8 bits per sample, this is sufficient for about 3 minutes of sound. RECORD1 recovers gracefully when it runs out of memory during recording, and lets you play back that portion of the sound stored successfully.

THE RECORD1 SOURCE CODE

Source code for RECORD1 is shown in Figures 2 through 7. If you have the Microsoft C Compiler and Windows Software Development Kit (SDK) installed, you can create RECORD1.EXE by running

```
NMAKE RECORD1.MSC
```

If you use the Borland C++ Compiler,

you should have installed the MDK in the same directories as the compiler. To create the executable, just run the following command:

```
MAKE -fRECORD1.BCP
```

You can also download all source code and the RECORD1.EXE executable from PC MagNet.

One thing you should be aware of: At the time of this writing (early September) I'm still using the beta version of Multimedia Windows and the MDK that was distributed in November of 1990. I'm patiently waiting for the retail release, and I don't know if it may require any changes to the source code.

RECORDING THE SOUND

Recording a sound involves opening the waveform audio hardware for input, and passing buffers to the API to receive the sound data.

RECORD1 maintains three memory blocks allocated from global memory. Two of these blocks are very small (at least

Environments

initially) and are allocated and locked during the WM_INITDIALOG message in DlgProc. Because the Multimedia Extensions require protected mode, there is no problem in keeping global memory blocks permanently locked; they remain movable in memory in any case.

The first memory block is a WAVEHDR structure pointed to by the pWaveHdr pointer. This structure is used to pass buffers to the waveform API. The pSaveBuffer pointer points to a buffer for storing the sounds; this is initially allocated as a 1-byte block. Later on, during recording, the buffer is increased in size to accommodate the sound data. I'll refer to this buffer as the "save buffer" because it is used to save the accumulated sound data. A third memory block, 16K in size and pointed to by pBuffer, is allo-

cated during recording to receive sound data. This 16K buffer is freed when recording is complete.

Because the WAVEHDR structure and the two buffers are passed to the waveform API, they must be allocated from global memory as movable and sharable.

Each of the eight buttons generates a WM_COMMAND message to DlgProc, the dialog procedure for REPORT1's window. Initially, only the Record button is enabled. Pressing this generates a WM_COMMAND message with wParam equal to ID_RECORD_BEG. To process the message, RECORD1 allocates the 16K buffer for receiving sound data, and initializes the fields of a PCMWAVEFORMAT structure that it passes to the waveInOpen function. This function returns a handle for use in subsequent waveIn functions.

The waveInOpen function also generates an MM_WIM_OPEN message. During this message, RECORD1 shrinks the save

buffer down to 1 byte in preparation for receiving data. (Of course, the first time you record something, the save buffer is already 1 byte in length, but during subsequent recordings, it could be much larger.) During the MM_WIM_OPEN message, RECORD1 also enables and disables the appropriate pushbuttons. Next, the program initializes the fields of the WAVEHDR structure (the first field of which is a pointer to the 16K buffer), calls waveInPrepareHeader to prevent swapping of the buffer to disk, and passes it to the API using waveInAddBuffer. Some flags are set and recording begins with a call to waveInStart.

At the standard sampling rate of 11.025 kHz with an 8-bit sample size, the 16K buffer will be filled in approximately 1.5 seconds. At that time, RECORD1 receives an MM_WIM_DATA message. In response to this message, the program calls waveInUnprepareHeader and then reallocates the save buffer based on the

RECORD1.C

1 OF 3

```
/*-----
RECORD1.C -- Multimedia Windows Waveform Audio Recorder
(c) Charles Petzold, 1991
-----*/

#include <windows.h>
#include <mmsystem.h>
#include <string.h>
#include "record1.h"

#define BUFFER_SIZE 16384 // Must be multiple of 2 for memory copies

BOOL FAR PASCAL DlgProc (HWND, WORD, WORD, LONG);

static char szAppName [] = "Record1";

int PASCAL WinMain (HANDLE hinstance, HANDLE hprevInstance,
LPSTR lpCmdLine, int nCmdShow)
{
    FARPROC lpDlgProc;

    lpDlgProc = MakeProcInstance (DlgProc, hinstance);
    DialogBox (hinstance, szAppName, NULL, lpDlgProc);
    FreeProcInstance (lpDlgProc);

    return 0;
}

void HugeMemRev (unsigned char huge *pBuffer, unsigned long lLength)
{
    unsigned char c;
    unsigned long i;

    for (i = 0; i < lLength / 2; i++)
    {
        c = pBuffer [i];
        pBuffer [i] = pBuffer [lLength - i - 1];
        pBuffer [lLength - i - 1] = c;
    }
}

BOOL FAR PASCAL DlgProc (HWND hwnd, WORD message, WORD wParam, LONG lParam)
{
    static BOOL      bRecording, bPlaying, bReverse, bPaused,
                    bEnding, bTerminating;
    static BYTE FAR *pBuffer;
    static BYTE huge *pSaveBuffer;
    static char      szOpenError[] = { "Error opening waveform audio!" };
    static char      szMemError[] = { "Error allocating memory!" };
    static DWORD     dwDataLength, dwRepetitions = 1;
    static GLOBALHANDLE hSaveBuffer, hNewBuffer, hBuffer, hWaveHdr;
    static HWAVEIN     hWaveIn;
    static HWAVEOUT     hWaveOut;
    static LPWAVEHDR     pWaveHdr;
    static PCMWAVEFORMAT pcm;

    switch (message)
    {
        case WM_INITDIALOG:
            // Allocate Memory for Wave Header
            hWaveHdr = GlobalAlloc (GHND | GMEM_SHARE, sizeof (WAVEHDR));
            pWaveHdr = (LPWAVEHDR) GlobalLock (hWaveHdr);

            // Allocate Memory for Save Buffer
            hSaveBuffer = GlobalAlloc (GHND | GMEM_SHARE, 1);
            pSaveBuffer = GlobalLock (hSaveBuffer);

            return TRUE;

        case WM_COMMAND:
            switch (wParam)
            {
                case ID_RECORD_BEG:
                    // Allocate Buffer Memory
                    hBuffer = GlobalAlloc (GHND | GMEM_SHARE,
                                           BUFFER_SIZE);

                    if (hBuffer == NULL)
                    {
                        MessageBeep (MB_ICONEXCLAMATION);
                        MessageBox (hwnd, szMemError, szAppName,
                                    MB_ICONEXCLAMATION | MB_OK);
                        return TRUE;
                    }

                    pBuffer = GlobalLock (hBuffer);

                    // Open Waveform Audio for Input

                    pcm.wf.wFormatTag = WAVE_FORMAT_PCM;
                    pcm.wf.nChannels = 1;
                    pcm.wf.nSamplesPerSec = 11025;
                    pcm.wf.nAvgBytesPerSec = 11025;
                    pcm.wf.nBlockAlign = 1;
                    pcm.wf.nBitsPerSample = 8;

                    if (waveInOpen (&hWaveIn, 0, &pcm.wf, hwnd, 0L,
                                    CALLBACK_WINDOW))
                    {
                        GlobalUnlock (hBuffer);
                        GlobalFree (hBuffer);

                        MessageBeep (MB_ICONEXCLAMATION);
                        MessageBox (hwnd, szOpenError, szAppName,
                                    MB_ICONEXCLAMATION | MB_OK);
                    }

                    return TRUE;

                case ID_RECORD_END:
                    // Reset Input to Return Last Buffer

                    bEnding = TRUE;
                    waveInReset (hWaveIn);
                    return TRUE;

                case ID_PLAY_BEG:
                    // Open Waveform Audio for Output

```

Figure 4: Here is all the C source code for the RECORD1.EXE, a digital tape recorder program.


```

pcm.wf.wFormatTag = WAVE_FORMAT_PCM ;
pcm.wf.nChannels = 1 ;
pcm.wf.nSamplesPerSec = 11025 ;
pcm.wf.nAvgBytesPerSec = 11025 ;
pcm.wf.nBlockAlign = 1 ;
pcm.wBitsPerSample = 8 ;

if (waveOutOpen (&hWaveOut, 0, &pcm.wf, hwnd, 0L,
    CALLBACK_WINDOW))
{
    MessageBeep (MB_ICONEXCLAMATION) ;
    MessageBox (hwnd, szOpenError, szAppName,
        MB_ICONEXCLAMATION | MB_OK) ;
}

return TRUE ;

case ID_PLAY_PAUSE:
    // Pause or Restart Output

    if (!bPaused)
    {
        waveOutPause (hWaveOut) ;
        SetDlgItemText (hwnd, ID_PLAY_PAUSE, "Resume") ;
        bPaused = TRUE ;
    }
    else
    {
        waveOutRestart (hWaveOut) ;
        SetDlgItemText (hwnd, ID_PLAY_PAUSE, "Pause") ;
        bPaused = FALSE ;
    }

    return TRUE ;

case ID_PLAY_END:
    // Reset Output for Close Preparation

    bEnding = TRUE ;
    waveOutReset (hWaveOut) ;
    return TRUE ;

case ID_PLAY_REV:
    // Reverse Save Buffer and Play

    bReverse = TRUE ;
    HugeMemRev (pSaveBuffer, dwDataLength) ;

    SendMessage (hwnd, WM_COMMAND, ID_PLAY_BEG, 0L) ;
    return TRUE ;

case ID_PLAY_REP:
    // Set Infinite Repetitions and Play

    dwRepetitions = -1 ;
    SendMessage (hwnd, WM_COMMAND, ID_PLAY_BEG, 0L) ;
    return TRUE ;

case ID_PLAY_SPEED:
    // Open Waveform Audio for Fast Output

    pcm.wf.wFormatTag = WAVE_FORMAT_PCM ;
    pcm.wf.nChannels = 1 ;
    pcm.wf.nSamplesPerSec = 22050 ;
    pcm.wf.nAvgBytesPerSec = 22050 ;
    pcm.wf.nBlockAlign = 1 ;
    pcm.wBitsPerSample = 8 ;

    if (waveOutOpen (&hWaveOut, 0, &pcm.wf, hwnd, 0L,
        CALLBACK_WINDOW))
    {
        MessageBeep (MB_ICONEXCLAMATION) ;
        MessageBox (hwnd, szOpenError, szAppName,
            MB_ICONEXCLAMATION | MB_OK) ;
    }

    return TRUE ;
}
break ;

case MM_WIM_OPEN:
    // Shrink Down the Save Buffer

    GlobalUnlock (hSaveBuffer) ;
    hSaveBuffer = GlobalReAlloc (hSaveBuffer, 1, GHND) ;
    pSaveBuffer = GlobalLock (hSaveBuffer) ;

    // Enable and Disable Buttons

    EnableWindow (GetDlgItem (hwnd, ID_RECORD_BEG), FALSE) ;
    EnableWindow (GetDlgItem (hwnd, ID_RECORD_END), TRUE) ;
    EnableWindow (GetDlgItem (hwnd, ID_PLAY_BEG), FALSE) ;
    EnableWindow (GetDlgItem (hwnd, ID_PLAY_PAUSE), FALSE) ;
    EnableWindow (GetDlgItem (hwnd, ID_PLAY_END), FALSE) ;
    EnableWindow (GetDlgItem (hwnd, ID_PLAY_REV), FALSE) ;
    EnableWindow (GetDlgItem (hwnd, ID_PLAY_REP), FALSE) ;
    EnableWindow (GetDlgItem (hwnd, ID_PLAY_SPEED), FALSE) ;
    SetFocus (GetDlgItem (hwnd, ID_RECORD_END)) ;

    // Set Up Header

    pWaveHdr->lpData = pBuffer ;
    pWaveHdr->dwBufferLength = BUFFER_SIZE ;
    pWaveHdr->dwBytesRecorded = 0L ;
    pWaveHdr->dwUser = 0L ;

    pWaveHdr->dwFlags = 0L ;
    pWaveHdr->dwLoops = 1L ;
    pWaveHdr->lpNext = NULL ;
    pWaveHdr->reserved = 0L ;

    // Prepare and Add

    waveInPrepareHeader (hWaveIn, pWaveHdr, sizeof (WAVEHDR)) ;
    waveInAddBuffer (hWaveIn, pWaveHdr, sizeof (WAVEHDR)) ;

    // Begin Sampling

    bRecording = TRUE ;
    bEnding = FALSE ;
    dwDataLength = 0L ;
    waveInStart (hWaveIn) ;
    return TRUE ;

case MM_WIM_DATA:
    // Unprepare Header

    waveInUnprepareHeader (hWaveIn, pWaveHdr, sizeof (WAVEHDR)) ;

    // Reallocate Save Buffer Memory

    GlobalUnlock (hSaveBuffer) ;
    hNewBuffer = GlobalReAlloc (hSaveBuffer, dwDataLength +
        pWaveHdr->dwBytesRecorded, 0) ;

    if (hNewBuffer == NULL)
    {
        pSaveBuffer = GlobalLock (hSaveBuffer) ;

        waveInClose (hWaveIn) ;
        MessageBeep (MB_ICONEXCLAMATION) ;
        MessageBox (hwnd, szMemError, szAppName,
            MB_ICONEXCLAMATION | MB_OK) ;
        return TRUE ;
    }

    hSaveBuffer = hNewBuffer ;
    pSaveBuffer = GlobalLock (hSaveBuffer) ;

    _lmemcpy ((char far *) (pSaveBuffer + dwDataLength), pBuffer,
        (int) pWaveHdr->dwBytesRecorded) ;

    dwDataLength += pWaveHdr->dwBytesRecorded ;

    if (bEnding)
    {
        waveInClose (hWaveIn) ;
        return TRUE ;
    }

    // Set the Header, Prepare and Add

    pWaveHdr->lpData = pBuffer ;
    pWaveHdr->dwBufferLength = BUFFER_SIZE ;
    pWaveHdr->dwBytesRecorded = 0L ;
    pWaveHdr->dwUser = 0L ;
    pWaveHdr->dwFlags = 0L ;
    pWaveHdr->dwLoops = 1L ;
    pWaveHdr->lpNext = NULL ;
    pWaveHdr->reserved = 0L ;

    waveInPrepareHeader (hWaveIn, pWaveHdr, sizeof (WAVEHDR)) ;
    waveInAddBuffer (hWaveIn, pWaveHdr, sizeof (WAVEHDR)) ;

    return TRUE ;

case MM_WIM_CLOSE:
    // Free the Buffer Memory

    GlobalUnlock (hBuffer) ;
    GlobalFree (hBuffer) ;

    // Enable and Disable Buttons

    EnableWindow (GetDlgItem (hwnd, ID_RECORD_BEG), TRUE) ;
    EnableWindow (GetDlgItem (hwnd, ID_RECORD_END), FALSE) ;
    SetFocus (GetDlgItem (hwnd, ID_RECORD_BEG)) ;

    if (dwDataLength > 0)
    {
        EnableWindow (GetDlgItem (hwnd, ID_PLAY_BEG), TRUE) ;
        EnableWindow (GetDlgItem (hwnd, ID_PLAY_PAUSE), FALSE) ;
        EnableWindow (GetDlgItem (hwnd, ID_PLAY_END), FALSE) ;
        EnableWindow (GetDlgItem (hwnd, ID_PLAY_REV), TRUE) ;
        EnableWindow (GetDlgItem (hwnd, ID_PLAY_REP), TRUE) ;
        EnableWindow (GetDlgItem (hwnd, ID_PLAY_SPEED), TRUE) ;
        SetFocus (GetDlgItem (hwnd, ID_PLAY_BEG)) ;
    }

    bRecording = FALSE ;

    if (!bTerminating)
        SendMessage (hwnd, WM_SYSCOMMAND, SC_CLOSE, 0L) ;

    return TRUE ;

case MM_WOM_OPEN:
    // Enable and Disable Buttons

    EnableWindow (GetDlgItem (hwnd, ID_RECORD_BEG), FALSE) ;
    EnableWindow (GetDlgItem (hwnd, ID_RECORD_END), FALSE) ;
    EnableWindow (GetDlgItem (hwnd, ID_PLAY_BEG), FALSE) ;
    EnableWindow (GetDlgItem (hwnd, ID_PLAY_PAUSE), TRUE) ;

```


RECORD1.C
3 OF 3

```

EnableWindow (GetDlgItem (hwnd, ID_PLAY_END), TRUE) ;
EnableWindow (GetDlgItem (hwnd, ID_PLAY_REP), FALSE) ;
EnableWindow (GetDlgItem (hwnd, ID_PLAY_REV), FALSE) ;
EnableWindow (GetDlgItem (hwnd, ID_PLAY_SPEED), FALSE) ;
SetFocus (GetDlgItem (hwnd, ID_PLAY_END)) ;

// Set Up Header

pWaveHdr->lpData = (char far *) pSaveBuffer ;
pWaveHdr->dwBufferLength = dwDataLength ;
pWaveHdr->dwBytesRecorded = 0L ;
pWaveHdr->dwUser = 0L ;
pWaveHdr->dwFlags = WHDR_BEGINLOOP | WHDR_ENDLOOP ;
pWaveHdr->dwLoops = dwRepetitions ;
pWaveHdr->lpNext = NULL ;
pWaveHdr->reserved = 0L ;

// Prepare and Write

waveOutPrepareHeader (hWaveOut, pWaveHdr, sizeof (WAVEHDR)) ;
waveOutWrite (hWaveOut, pWaveHdr, sizeof (WAVEHDR)) ;

bEnding = FALSE ;
bPlaying = TRUE ;
return TRUE ;

case MM_WOM_DONE:
waveOutUnprepareHeader (hWaveOut, pWaveHdr, sizeof (WAVEHDR)) ;
waveOutClose (hWaveOut) ;
return TRUE ;

case MM_WOM_CLOSE:
// Enable and Disable Buttons

EnableWindow (GetDlgItem (hwnd, ID_RECORD_BEG), TRUE) ;
EnableWindow (GetDlgItem (hwnd, ID_RECORD_END), TRUE) ;
EnableWindow (GetDlgItem (hwnd, ID_PLAY_BEG), TRUE) ;
EnableWindow (GetDlgItem (hwnd, ID_PLAY_PAUSE), FALSE) ;
EnableWindow (GetDlgItem (hwnd, ID_PLAY_END), FALSE) ;
EnableWindow (GetDlgItem (hwnd, ID_PLAY_REV), TRUE) ;
EnableWindow (GetDlgItem (hwnd, ID_PLAY_REP), TRUE) ;
EnableWindow (GetDlgItem (hwnd, ID_PLAY_SPEED), TRUE) ;
SetFocus (GetDlgItem (hwnd, ID_PLAY_BEG)) ;

SetDlgItemText (hwnd, ID_PLAY_PAUSE, "Pause") ;
bPaused = FALSE ;

dwRepetitions = 1 ;
bPlaying = FALSE ;

if (bReverse)
{
HugeMemRev (pSaveBuffer, dwDataLength) ;
bReverse = FALSE ;
}

if (bTerminating)
SendMessage (hwnd, WM_SYSCOMMAND, SC_CLOSE, 0L) ;

return TRUE ;

case WM_SYSCOMMAND:
switch (wParam)
{
case SC_CLOSE:
if (bRecording)
{
bTerminating = TRUE ;
bEnding = TRUE ;
waveInReset (hWaveIn) ;
return TRUE ;
}

if (bPlaying)
{
bTerminating = TRUE ;
bEnding = TRUE ;
waveOutReset (hWaveOut) ;
return TRUE ;
}

GlobalUnlock (hWaveHdr) ;
GlobalFree (hWaveHdr) ;

GlobalUnlock (hSaveBuffer) ;
GlobalFree (hSaveBuffer) ;
EndDialog (hwnd, 0) ;
return TRUE ;
}
break ;
}
return FALSE ;
}
    
```

dwDataLength variable and the dwBytesRecorded field of the WAVEHDR structure. If the reallocation fails, then RECORD1 calls waveInClose to stop the recording.

If the reallocation process is successful, RECORD1 will copy the data from the 16K buffer into the save buffer. It then will reinitialize the fields of the

WAVEHDR structure, and call waveInPrepareHeader and waveInAddBuffer again. This process continues until RECORD1 runs out of memory for the save buffer, or until the user presses the End button.

The End button generates a WM_COMMAND message with wParam equal to ID_RECORD_END. Processing this

message is very simple. RECORD1 sets the bEnding flag to TRUE and calls the waveInReset function.

WaveInReset causes recording to stop and generates an MM_WIM_DATA message containing a partially filled buffer. RECORD1 responds to this final MM_WIM_DATA message normally, except that it closes the waveform input device by calling waveInClose.

The waveInClose message generates an MM_WIM_CLOSE message, and RECORD1 responds to this message by freeing the 16K buffer and enabling and disabling the appropriate pushbuttons. In particular, if the save buffer contains data (which it almost always will unless the first reallocation fails), the play buttons are enabled.

PLAYING THE SOUND

After recording a sound, the save buffer contains the total accumulated sound data. If the recording lasts longer than 6 seconds, this buffer will be larger than 64K. Generally this doesn't create any problems; however, accessing the block requires a little caution. Fortunately, when playing a sound, the entire huge block can be passed to the API.

RECORD1.RC
COMPLETE LISTING

```

/*-----
RECORD1.RC resource script
-----*/

#include <windows.h>
#include "record1.h"

Record1 DIALOG 32768, 0, 152, 74
STYLE WS_OVERLAPPED | WS_CAPTION | WS_SYSMENU | WS_MINIMIZEBOX | WS_VISIBLE
CAPTION "Waveform Audio Recorder"
{
DEFPUSHBUTTON "Record" ID_RECORD_BEG, 28, 8, 40, 14
PUSHBUTTON "End" ID_RECORD_END, 76, 8, 40, 14, WS_DISABLED

PUSHBUTTON "Play" ID_PLAY_BEG, 8, 30, 40, 14, WS_DISABLED
PUSHBUTTON "Pause" ID_PLAY_PAUSE, 56, 30, 40, 14, WS_DISABLED
PUSHBUTTON "End" ID_PLAY_END, 104, 30, 40, 14, WS_DISABLED

PUSHBUTTON "Reverse" ID_PLAY_REV, 8, 52, 40, 14, WS_DISABLED
PUSHBUTTON "Repeat" ID_PLAY_REP, 56, 52, 40, 14, WS_DISABLED
PUSHBUTTON "Speedup" ID_PLAY_SPEED, 104, 52, 40, 14, WS_DISABLED
}
    
```

Figure 5: This resource script defines the appearance of the program's window.

Environments

When the user selects the Play button, DlgProc receives a WM_COMMAND message with wParam equal to ID_PLAY_BEG. The program responds by initializing the fields of a PCMWAVEFORMAT structure and calling waveOutOpen.

The waveOutOpen call generates an MM_WOM_OPEN message. During this message, RECORD1 enables and disables the appropriate pushbuttons (allowing only Pause and End), initializes the fields of the WAVEHDR structure with the save buffer, prepares it by calling waveOutPrepareHeader, and begins playing with a call to waveOutWrite.

Normally, the sound will continue until all the data in the buffer has been played. At that time, an MM_WOM_DONE message is generated. If there are additional buffers to be played, a program can pass them out to the API at that time. RECORD1 plays only one big buffer, so the program simply unprepares the header and calls waveOutClose.

The waveOutClose function generates an MM_WOM_CLOSE message. During this message, RECORD1 enables and disables the appropriate buttons, allowing the sound to be played again or a new sound to be recorded.

I've also included a second End button so the user can stop playing the sound at any time before the save buffer has completed. This button generates a WM_COMMAND message with wParam equal to ID_PLAY_END and the program responds by calling waveOutReset. This function generates an MM_WOM_DONE message, which is processed normally.

RECORD1.H		COMPLETE LISTING
/*----- RECORD1.H header file -----*/		
#define	ID_RECORD_BEG	10
#define	ID_RECORD_END	11
#define	ID_PLAY_BEG	12
#define	ID_PLAY_PAUSE	13
#define	ID_PLAY_END	14
#define	ID_PLAY_REV	15
#define	ID_PLAY_REP	16
#define	ID_PLAY_SPEED	17

Figure 6: This file defines identifiers used in both RECORD1.C and RECORD1.RC.

RECORD1.DEF		COMPLETE LISTING
;----- ; RECORD1.DEF module definition file ;-----		
NAME	RECORD1	
DESCRIPTION	'Waveform Audio Recorder (c) Charles Petzold, 1991'	
EXETYPE	WINDOWS	
STUB	'WINSTUB.EXE'	
CODE	PRELOAD MOVEABLE DISCARDABLE	
DATA	PRELOAD MOVEABLE MULTIPLE	
HEAPSIZE	1024	
STACKSIZE	8192	
EXPORTS	DlgProc	

Figure 7: This is the program's module definition file.

RECORD1's window also includes a Pause button. Processing this button is very simple. The first time it's pushed, RECORD1 calls waveOutPause to halt the sound, and sets the text in the Pause button to Resume. Pressing the Resume button starts the playback going again by a call to waveOutRestart.

SPECIAL EFFECTS

To make the program just a little more interesting, I've also included buttons labeled Reverse, Repeat, and Speedup. These buttons generate WM_COMMAND messages with wParam values equal to ID_PLAY_REV, ID_PLAY_REP, and ID_PLAY_SPEED. Playing the sound in reverse is simple. Because the program has access to the memory buffer in which the sound data is stored, all it has to do is reverse the order of the bytes and play the sound normally. RECORD1 includes a small function named HugeMemRev that is used to reverse the order of the bytes in a huge memory block. It calls this function during the WM_COMMAND message before playing the block, and again at the end of the MM_WOM_CLOSE message to restore it.

The Repeat button plays the sound over and over again. This isn't very complicated because the API includes a provision for repeating a sound. It involves setting the dwLoops field in the WAVEHDR structure to the number of repetitions, and the dwFlags field to WHDR_BEGINLOOP for the beginning buffer in the loop, and WHDR_ENDLOOP for the end buffer. Because RECORD1 uses only one buffer for playing the sound, these two flags are combined in the dwFlags field.

Playing the sound twice as fast is also easy. When the fields of the PCMWAVEFORMAT structure are being initialized

in preparation for opening waveform audio for output, the nSamplesPerSec and nAvgBytesPerSec fields in the WAVEFORMAT structure (which is part of the PCMWAVEFORMAT structure) are set to 22050 rather than 11025.

A BETTER WAY?

Does RECORD1 seem inordinately complex to you? It does to me. Perhaps this is because we're all relative newcomers to the Multimedia Windows API, but I found it particularly tricky to deal with the interaction between the waveform audio function calls and the messages they generate, and then in the midst of all this, to deal with memory shortages as well.

There's a lot to worry about when dealing with this API, and maybe that's why it's called the low-level interface. Multimedia Windows also includes a high-level interface called the *Media Control Interface* or MCI. MCI is quite versatile because the same API eventually can be used to control many different types of multimedia hardware, including waveform audio, MIDI synthesizers, CD-ROM drives, videodisk players, tape recorders, VCRs, scanners, and graphics movies.

For waveform audio, one of the primary differences between the low-level interface and MCI is that MCI records sound data to a waveform file, and plays back the sound by reading the file. This makes it difficult to perform the "special effects" that RECORD1 implements, because you'd have to read in the file, manipulate it, and write it back out before playing the sound.

This is a typical tradeoff: versatility versus ease of use. The low-level interface gives you flexibility, but MCI (for the most part) is easier. We'll examine just how easy MCI can be in the next installment of this column. ■

by
Ray Duncan

Power Programming

Optimizing Assembly Language Programs, Part 3

In the last two installments of this column, we discussed some general optimization issues, and then took a more detailed look at specific optimization techniques related to jumps, calls, and strength reduction. In this issue, we'll talk about a few more types of "local" optimizations: loop optimizations, table lookups, and the exploitation of CPU-specific instructions. But again, I want to strongly emphasize that you should only resort to these techniques after you've carefully chosen your algorithms and data structures, completely implemented, tested, and debugged your program, and isolated your program's bottlenecks with appropriate software probes or profiling tools. Dr. Knuth's quip bears repeating, "Premature optimization is the root of much programming evil."

LOOP OPTIMIZATIONS

The compiler literature bulges with all manner of loop optimizations, under such picturesque names as "code hoisting," "loop-invariant code motion," "induction variable elimination," "loop jamming," "loop unrolling," and the like. However, we can boil down the principles behind all of these into just two basic rules of thumb:

- Never do anything inside a loop that you can do somewhere else.
- Eliminate the jumps that control loops whenever possible.

Our first rule is a corollary to the old adage that 90 percent of a program's execution time is spent in 10 percent of the code. If you check where that 10 percent of the code is located, you'll find it's usually inside of loops of some sort. So one of the first things to do when you're trying to speed up a program is to profile it, identify the "hot spots," and inspect each of those hot spots for a loop that is a possible target for optimization. A loop construct may not always jump out at you as a nice series of instructions ending with a LOOP, LOOPZ, or LOOPNZ (especially if someone else wrote the code,

■ We continue our discussion of classic assembly language optimization techniques with an examination of common loop optimizations, table lookups, and some CPU-dependent optimizations.

of course!), but any sequence that is executed repetitively based on the value of some controlling variable or flag qualifies for our purposes here.

In general, you'll find that the loops fall into two categories: loops whose speed is constrained by some external synchronization mechanism, and loops that are CPU-bound. An example of the first category might be one that sends a string of characters out to the parallel port; your code can't run any faster than the parallel port can accept characters, and the parallel port is at least a couple orders of magnitude slower than any reasonable sequence of machine instructions that might be used to drive it. You can optimize such externally constrained loops for your own entertainment, but you could probably put the effort to better use somewhere else. The loops in the second category, which are basically free-running, are the ones to concentrate on.

To fully optimize your program's loops, you've got to approach the problem methodically. Carefully inspect each loop

for operations that don't depend on the loop's control variable, and "hoist" those operations out of the loop (in most cases this can be accomplished by moving them ahead of the loop). Analyze the remaining code and simplify it wherever possible, using table lookups, CPU-specific instructions, strength reduction, and any other tricks you have at your command to shorten the code and eliminate "expensive" instructions. If there are any calculations that depend on the current value of the loop variable, try to rearrange the code to turn this situation on its head, so that the calculations are done outside the loop instead and the starting and ending values for the loop variable depend on the results.

For example, imagine a poorly coded loop that sums every fifth value in an array of single-precision integers, leaving the result in AX:

```
items equ 100
array dw items dup (?)

xor cx,cx ; init counter
xor ax,ax ; init sum
L1: mov bx,cx ; form pointer
add bx,bx ; * 2
add bx,bx ; * 4
add bx,cx ; * 5
add ax,[bx+array]
inc cx
cmp cx,(items/5)
jne L1
```

After simplifying the loop, we have:

Power Programming

```
items equ 100
array dw items dup (?)
.
.
xor ax,ax ; init sum
mov bx,offset array
L1: add ax,[bx]
add bx,10
cmp bx,offset array+
(items*2)
jnb L1
```

Once you've optimized the contents of your loops as much as possible, you need to see where you can eliminate the compares and conditional jumps that are controlling the loops. The motive for this is the same as for the jump and call optimizations we discussed in the last issue. Intel 80x86 CPUs rely heavily on a simple pipelining system consisting of a bus interface unit (BIU), a prefetch queue that is filled with instructions from memory by the BIU, and an execution unit (EU) that takes instructions out of the prefetch queue and decodes them. Whenever a jump or call is executed, the prefetch queue is invalidated, the memory cycles that were used to put instructions beyond the jump into the queue are wasted, and the EU must stall until the BIU gets it some instructions to work on from the new execution address. Thus, jumps and calls are far more costly in practice than they seem if you just count machine cycles according to the Intel databooks.

One way to get rid of compares and conditional jumps is *loop jamming* or *loop fusion*—that is, rearranging code so that two or more loops that execute the same number of times are combined into one loop. For example, loops of the form

```
mov cx,100
L1: ; do something here
loop L1
mov cx,100
L2: ; do something else here
loop L2
```

can often be combined into a single loop that looks like this:

```
mov cx,100
L1: ; do something here
; do something else here
loop L1
```

The other way to get rid of loops is *loop unrolling*—eliminating the overhead of loop control structures by simply duplicating the contents of the loop an appropriate number of times. This is especially appropriate when the time required to execute the contents of the loop is overwhelmed by the time required to execute the jump that controls the loop. For example, a loop of the form

```
mov cx,3
L1: add ax,[bx]
add bx,2
loop L1
```

might be rewritten as

```
add ax,[bx]
add bx,2
add ax,[bx]
add bx,2
add ax,[bx]
```

and then as

```
add ax,[bx]
add ax,[bx+2]
add ax,[bx+4]
```

Unrolling loops is a classic tradeoff of speed for memory. Each time you evaluate a loop for unrolling, you have to decide whether the size of the loop and the number of iterations makes it a reasonable candidate for this optimization, based on your program's overall size and the machine resources available. Sometimes unrolling pays off in funny places. For example, all of us who write 80x86 assembly code have learned to be alert for situations where we can use the special string instructions. We often write little sequences of code like this:

```
mov cx,3
mov si,offset string1
mov di,offset string2
rep movsw
```

There's a loop here, but it's implicit: Processing of the REP prefix involves some setup time, and the effect of the REP is exactly as though we had written this instead:

```
L1: movsw
loop L1
```

On some Intel CPUs, for small numbers of iterations of string instructions, it's faster

to eliminate the REP prefix and write the string instructions out linearly. In this case

```
movsw
movsw
movsw
```

But this is the kind of optimization where you have to benchmark the alternatives in the context of your actual program to find out where the payoff point is. The speed of one of these snippets of code is not strictly predictable by counting machine cycles and opcode bytes, because it depends on the code's context, the bandwidth of the memory bus, the differing sizes of the prefetch queue on the various CPUs, the presence (and size) or absence of an off-CPU cache, and so on.

TABLE LOOKUPS

We already noted that it pays to move calculations from inside a loop to outside (or from a deeply nested loop to an outer loop), and to defer calculations until their result is actually needed whenever possible. An even more powerful optimization is to move calculations from the program's execution time to its compile or assembly time, or to perform the calculations in another, specialized program and write the results into an intermediate file where they can be retrieved as needed. A particularly useful category of this type of optimization is known as *table lookup*.

Let's consider an application where table lookup might be extremely profitable. Imagine a graphics program that needs to rotate and translate line segments in order to provide the user with the illusion of three-dimensional projections, and thus needs to be able to determine the sines and cosines of angles. Now, the calculation of sines and cosines is typically implemented with polynomial expansions in floating-point arithmetic, and involves a series of multiply and division operations that are extremely expensive. Moreover, the sines and cosines obtained in this way are far more precise than are needed on ordinary PC graphics adapters; even single-precision (32-bit) floating-point sines and cosines will be calculated to at least 8 digits of precision, while only 4 or 5 digits are really needed (since typical PC graphics adapters have at best only 1,024-by-768 resolution).

Here's how we could use table lookups to obtain the sines of angles in increments of 1 degree to 4-digit precision.

Power Programming

First, we'd create a data structure in which each slot corresponded to an angle in degrees and contained the sine of that angle multiplied by 10,000:

```
table    dw    0      ; sin(0)
          dw   175    ; sin(1)
          dw   349    ; sin(2)
          .
          .
          .
```

Once the table is in hand, we can easily write a short routine that will accept an angle of 0 to 359 degrees in register AX and return the sine of that angle in AX:

```
; Function SINE
; Call    AX = degrees
; Return AX = sine*10000
sine     proc near
          push  bx
          mov  bx,ax
          add  bx,bx
          mov  ax,[bx+table]
          pop  bx
          ret
sine     endp
```

To make the procedure even faster, we could convert it to a macro and expand it in-line wherever it was needed. Figure 1

contains a more general version of this and a corresponding cosine procedure.

Sometimes table lookup techniques can be used very effectively in places that wouldn't ordinarily occur to you. For example, if you were given the job of writing a routine to return the number of nonzero bits in a byte, your first impulse might be to use shifts and a loop to count the nonzero bits one by one. But a much faster approach would be to build a byte table whose positions corresponded to each of the possible values of a byte, from 0 to 255, with the number of nonzero bits for a particular value in the table's byte at that position:

```
table    db  0      ; bits set in 00H
          db  1      ; bits set in 01H
          db  1      ; bits set in 02H
          db  2      ; bits set in 03H
          .
          .
          .
```

```
; Function BITS
; Call    AL = byte value
; Return AL = no. of nonzero bits
bits     proc near
          push  bx
          mov  bl,al
          xor  bh,bh
          mov  al,[table+bx]
          pop  bx
          ret
bits     endp
```

Again, for even more speed, you can convert this procedure to a macro and assemble it in-line wherever it's needed. For byte tables, you may be able to get better performance by replacing the MOV instruction with the special string instruction XLAT. However, it's important to note that this technique is hardly limited to byte tables. I've seen an ingenious word-counting utility, written by Terje Mathisen, which used a 64K lookup table to inspect each possible two-character sequence for word breaks. And Gordon Letwin reportedly used a similar technique to scan free-space bitmaps for collections of free sectors in OS/2's High Performance File System (HPFS).

CPU-SPECIFIC OPTIMIZATIONS

If your program is going to run on a specific Intel CPU model, or if you think it's worth the trouble to have several versions of the program for each of the possible CPU types it might be used on, you can take advantage of the machine instructions that are unique to each CPU type when you do your local optimizations.

Compared with the 8086 and 8088, the 80286 has quite a few additional instructions that can help performance:

- Shifts and rotates by literal counts other than 1;
- PUSH literal value;
- IMUL by literal value;
- String input and output instructions;

ITRIG.ASM		1 OF 2	
title ITRIG - Integer Trig Lookup			
page 55,132			
; ITRIG.ASM -- Integer Trig Lookup Routines			
; Copyright (C) 1991 Ray Duncan			
; DATA segment word public 'DATA'			
table	dw 0 ; 0 degrees	dw 4348 ; 27	
	dw 175 ; 1	dw 4695 ; 28	
	dw 349 ; 2	dw 4868 ; 29	
	dw 523 ; 3	dw 5088 ; 30	
	dw 698 ; 4	dw 5158 ; 31	
	dw 872 ; 5	dw 5299 ; 32	
	dw 1045 ; 6	dw 5446 ; 33	
	dw 1219 ; 7	dw 5592 ; 34	
	dw 1392 ; 8	dw 5736 ; 35	
	dw 1564 ; 9	dw 5878 ; 36	
	dw 1736 ; 10	dw 6018 ; 37	
	dw 1908 ; 11	dw 6157 ; 38	
	dw 2079 ; 12	dw 6293 ; 39	
	dw 2250 ; 13	dw 6428 ; 40	
	dw 2419 ; 14	dw 6561 ; 41	
	dw 2588 ; 15	dw 6691 ; 42	
	dw 2756 ; 16	dw 6820 ; 43	
	dw 2924 ; 17	dw 6947 ; 44	
	dw 3090 ; 18	dw 7071 ; 45	
	dw 3256 ; 19	dw 7193 ; 46	
	dw 3420 ; 20	dw 7314 ; 47	
	dw 3584 ; 21	dw 7431 ; 48	
	dw 3746 ; 22	dw 7547 ; 49	
	dw 3907 ; 23	dw 7660 ; 50	
	dw 4067 ; 24	dw 7771 ; 51	
	dw 4226 ; 25	dw 7880 ; 52	
	dw 4384 ; 26	dw 7986 ; 53	
		dw 8090 ; 54	
		dw 8192 ; 55	
		dw 8290 ; 56	
		dw 8387 ; 57	
		dw 8480 ; 58	
		dw 8572 ; 59	
		dw 8660 ; 60	
		dw 8746 ; 61	

Figure 1: This is the source code for a module that contains integer sine and cosine routines. These routines use table lookup and simple trigonometric identities to return sine and cosine function values for 0 to 359 degrees.

Power Programming

ITRIG.ASM

2 OF 2

```

; 62
; 63
; 64
; 65
; 66
; 67
; 68
; 69
; 70
; 71
; 72
; 73
; 74
; 75
; 76
; 77
; 78
; 79
; 80
; 81
; 82
; 83
; 84
; 85
; 86
; 87
; 88
; 89
; 90 degrees

DATA ends

TEXT segment word public 'CODE'
    assume cs:_TEXT,ds:_DATA

; TRIG: Worker routine for SINE and COSINE
; Call with: AX = degrees 0-180
; Returns: AX = function value
; Destroys: BX
;
; trig: proc near
; mov     bx,ax          ; bx <- degrees
; cmp     bx,90          ; degrees = 90-180?
; jle     trig1           ; no, jump
; sub     bx,180         ; yes, reduce the angle
; neg     bx             ; to range 0-90

; trig1: call     bx,1          ; bx <- degrees * 2
; mov     ax,[bx+table]      ; extract function value
; ret
; trig: endp

; COSINE Return cosine of angle
; Call with: AX = degrees 0-359
; Returns: AX = cosine of angle * 10000
; Destroys: Nothing
;
; cosine: public cosine
; proc near
; add     bx,90          ; add 90 degrees to angle and
; fall through to sine routine
; cosine: endp

; SINE Return sine of angle
; Call with: AX = degrees 0-359
; Returns: AX = sine of angle * 10000
; Destroys: Nothing
;
; sine: public sine
; proc near
; push    bx             ; save registers
; push    dx
; mov     bx,360         ; degrees -> double precision
; idiv    bx             ; reduce angle to 0-359 degrees
; mov     ax,dx          ; AX <- reduced angle
; or      ax,ax          ; is angle negative?
; jns     sine2          ; no, jump
; add     ax,360         ; yes, make it positive
; sine2: cmp     ax,180   ; is angle >180 degrees?
; jle     sine3          ; no, jump
; sub     ax,180         ; yes, reduce to 0-179 degrees
; call    trig           ; and look up function value
; neg     ax             ; negate result and return
; sine3: call    trig
; sine4: pop     dx
; sine4: pop     bx
; sine: endp
; return to caller

TEXT ends
    end

```

■ PUSH (push all) and POP (pop all);

■ ENTER and LEAVE to set up and destroy stack frames;

■ BOUND instruction to check array indices.

If your program will only run on an 80286 or better, you should also word-align all data items and the targets of jump or call instructions. This may improve your performance a few percent at a relatively trivial cost in memory. (The 8086 also benefits from word alignment, although the 8088 does not because of its 8-bit external data bus.)

On the 80386DX and its clones, you can improve the performance of 16-bit programs by using any of the already mentioned 80286 instructions, by aligning data items and the destinations of jumps or calls on 32-bit boundaries, and by exploiting the following additional features:

■ 32-bit registers (which must be used cautiously, because they are not preserved by some DOS emulators such as the DOS compatibility box in OS/2 versions prior to 1.3);

■ Move with zero-extension or sign-

extension (MOVZX or MOVSBX);

■ 64-bit (double-register) shifts (SHLD and SHRD);

■ Set byte to true or false according to CPU flags, which eliminates the need for a conditional jump (SETZ, SETC, and so on);

■ Bit test, clear, set, and scan instructions (BT, BTC, BTR, BTS, BSF, BSR);

■ Generalized indexed addressing and scaled indexed addressing modes;

■ Fast multiplication with LEA via scaled indexed addressing;

■ "Long" conditional jumps;

■ 32-bit by 32-bit multiply and 64-bit by 32-bit divide;

■ The additional segment registers (FS and GS).

Of course, the way to get the most mileage out of the 80386 architecture is to use a DOS extender or OS/2 2.0, and port your application to 32-bit protected mode. You will then have full access to the 80386's 32-bit registers, improved addressing, and 4GB linear address space.

The 80486 offers only two additional instructions not present on the 80386 that might be used by an application program:

■ BSWAP (convert Little-endian to Big-

endian data format and vice versa); and

■ CMPXCHG (compare and exchange, for maintenance of semaphores).

However, the instruction cycle counts on the 80486 are quite different from the 80386 and 80286. In general, the simpler instructions have been speeded up at the expense of the more complex instructions, which means that code originally written for an 8088 may often run faster on an 80486 than code written for an 80286 or 80386. Such is life. Other things to think about on the 80486DX are its 8K internal cache, which prefers to find things aligned on 16-byte (paragraph) boundaries, and its built-in numeric coprocessor. Unfortunately, Intel's recent release of the 80486SX without a (functional) numeric coprocessor means that we still can't take hardware floating-point support for granted on high-end PCs.

THE IN-BOX

Please send your questions, comments, and suggestions to me at any of the following electronic mail addresses:

PC MagNet: 72241,52

MCI Mail: rduncan

BIX: rduncan

by
Fran Finnegan

Windows

TEMPORARY FILES

I have been reading your magazine for several years and have always enjoyed the information provided. However, in the August 1991 issue, you say that it is easy to get rid of temporary (.TMP) files by placing them on a RAM drive. I find it very disturbing that you did not warn people that writing the .TMP files to a RAM drive defeats the purpose of those .TMP files.

I have had many crashes, lockups, and Unrecoverable Application Errors (UAEs) on my system and in *Windows*. If it were not for the .TMP files, several hours of work would have had to be redone.

Please let your readers know what the purpose of .TMP files is before recommending deleting files with the power switch.

Sincerely, and now a much more wary reader,

Chuck Kinsman
Sunnyvale, California



The purpose of .TMP files is not for backup, but for the *temporary* storage of *Windows* and *Windows* applications (and DOS applications that recognize the TMP= environment setting). Temporary files are placed on a RAM drive if you have one installed via your CONFIG.SYS file and if you set the TMP= environment variable to point to it. Using a RAM drive for .TMP files speeds up *Windows*, provided you have sufficient memory besides the memory consumed by the RAM drive.

Microsoft *also* recommends placing .TMP files on a RAM drive as follows: If you have 5MB of memory, your RAM drive should be 2MB if you run in Standard mode, and 1MB if you run in 386 Enhanced mode. In both cases, the company suggests setting TMP= to point to the RAM drive. (If you have 8MB of memory, your RAM drive should be 3MB if you run in Standard mode and 2MB if you run in 386 Enhanced mode.)

Most .TMP files are binary files that have *no* meaning outside the context of

- **TEMPORARY FILES:**
Don't depend on .TMP files for backup; put them on a RAM drive to speed up *Windows*.
- **COMMAND LINE LIMIT:**
Use DOS's SUBST command to overcome Program Manager's command line limit of 80 characters.
- **A LARGER PROGRAM MANAGER FONT:** If Program Manager's (or any other application's) font is too small for you, you may be able to make it bigger.

the current *Windows* session. If you have been able to extract useful information out of them after a system reboot, you have been extremely lucky. A safer approach is to make backup copies of your work frequently.

Backup and .TMP files have little to do with each other. To rely on temporary files on a hard disk to recover data in the case of a reboot is courting disaster. Your UAE problems will be virtually eliminated in *Windows* 3.1—a much stabler environment than *Windows* 3.0.

COMMAND LINE LIMIT

When launching *Word for Windows*, I wanted to be able to load multiple documents. What I really needed was something equivalent to *Excel*'s workspace file, which allows you to open multiple spreadsheet documents in a single step just by opening the workspace file or, more simply, by including the name of the workspace file on the Program Item Properties command line of the *Excel* icon.

It would be nice if Microsoft implemented such a feature for *Winword*, especially since *Winword* shares *Excel*'s ability to open multiple documents within a single instance of the application. But until it does, I had to come up with a way to open multiple *Winword* documents.

The solution I found is to list the names of the documents I wanted to open in *Winword* on the Program Manager icon's command line for *Winword*, with each document name separated by a space.

The length of the command line (Program Manager allows only 80 characters!) turned out to be a big restriction, since you need to include all of the path information for each document. In my case, the maximum number of documents I could include is two, because of the long pathnames. Fortunately, I thought of a way around this limitation—using the DOS SUBST command to replace the long pathnames with a drive letter. You can include the SUBST commands in your AUTOEXEC.BAT at start-up. For example, my AUTOEXEC.BAT file contains the following entries:

```
subst k: d:\data\winword
\finance\oct91
subst l: d:\data\winword
\finance\nov91
```

My *Winword* icon's command line references these drives as follows:

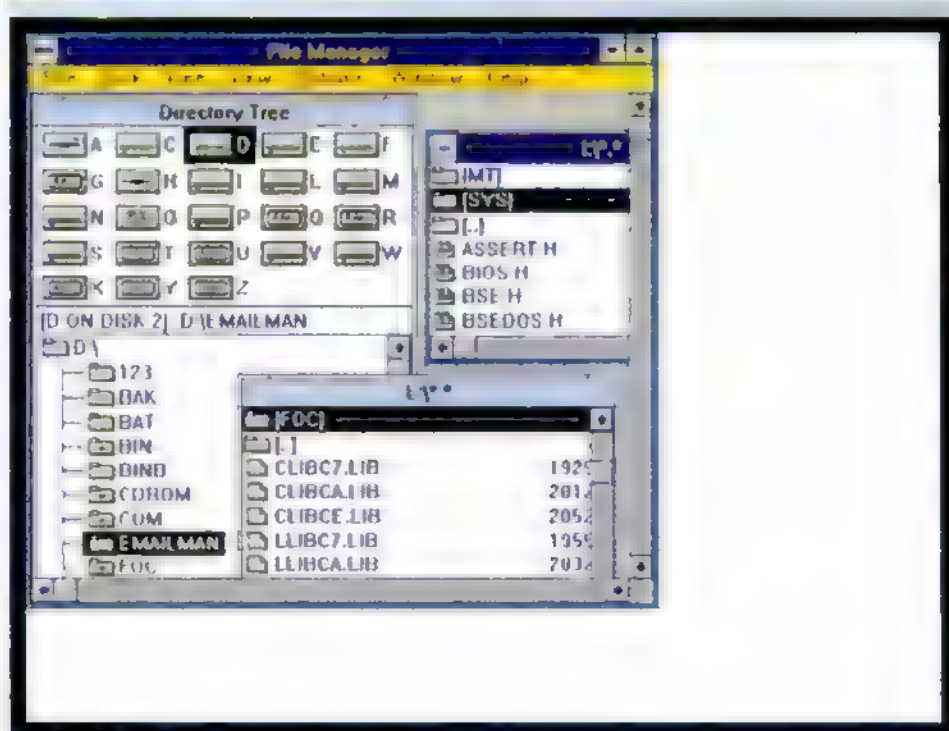
```
c:\winword\winword.exe
k:\exp_oct.doc l:\exp_nov.doc
```

This example assumes the drive letters K: and L: are not already being used as, say, network drives (if they are, choose different letters for your SUBST commands). Note that you'll also need to include a LASTDRIVE=L statement in your CONFIG.SYS file, where L is the last drive letter (whether physical or logical) that exists on your system.

Kathy Kowell
Cincinnati, Ohio

Windows

Figure 1: After you use the SUBST command, File Manager displays different icons for directories on hard disks, RAM drives, CD-ROM drives, and network drives.



PC I've always thought that Program Manager's command line limit of 80 characters represented brain-dead programming, since both DOS and Windows accept a command line of up to 127 characters! The Program Manager limit of 80 characters is totally artificial and makes no sense. It forces users to resort to techniques such as this.

If you've been using DOS for a long time, you probably know about the SUBST (substitute) command. If you don't, it's fully documented in your DOS manual and is quite simple. It provides you with a method for making shortcut references to directories, in that you only have to specify a drive letter for the directory instead of the full path to it.

SUBST is frequently used to shorten the DOS PATH environment variable, which is limited to 127 characters. These substitution shortcuts are fully compatible with Windows and they're so useful, in fact, that for as long as I can remember I've had a LASTDRIVE=Z statement in my CONFIG.SYS file. Without a LASTDRIVE= entry, the DOS default is a maximum drive of either E: or the highest physical, logical, and/or RAM drive you have on your system. You can substitute only up to this "last drive" letter, hence the need for LASTDRIVE= to expand the capability. Note that network drives always begin with the letter *after* the DOS default or LASTDRIVE= setting.

Here's a listing of some of the substitutions on my system (without showing specific directories). You can see the many

possibilities that SUBST offers.

I: C include files directory
K: Windows SDK/DDK directory
L: C library files directory
M: E-mail directory
P: PIF files directory
R: RAM drive root
S: Windows SYSTEM directory
T: TEMP/TMP directory
W: Windows main directory
X: Excel directory

There's a bonus when using File Manager and the MS-DOS Executive—they show as icons all drives you've SUBSTituted. File Manager actually uses different icons for directories on hard disks, RAM drives, CD-ROM drives, and network drives, as you can see in Figure 1. You can get to a SUBSTed directory simply by clicking on a drive icon.

If you're on a network, though, you'll need to be careful. You probably shouldn't change your CONFIG.SYS's LASTDRIVE= statement without checking first with your network administrator. Since network log-on scripts make certain assumptions about the LASTDRIVE= setting, this may restrict the latitude you have with this statement, preventing you from effectively using Ms. Kowell's tip.

A LARGER PROGRAM MANAGER FONT

I work for an organization that supports and educates PC users with disabilities. A large part of that support includes adapt-

ing the system so individuals with various impairments are able to access it. Recently I was asked whether I could enlarge the Windows cursor for a visually impaired student. When I called Microsoft and asked the question, the company sent me (free of charge) an impressive collection of drivers.

However, looking over a group of shareware utilities for Windows, I came across CHNGCRSR.EXE. It's exactly what I was looking for. You can use the cursors that come with it, or make your own. It will automatically load the desired cursor upon startup. [CHNGCRSR.EXE, written by Jim Seidman, can be downloaded from PC MagNet—Ed.]

I still have one question though: Can you increase the size of the font in Program Manager's program groups? It is so small as to be unreadable to the visually impaired.

Roger Smith

Coos Bay, Oregon

PC In Windows, you can only change the font an application uses if that application gives you the capability to do so. Applications usually do provide this function as one of their menu bar options. Unfortunately, Program Manager doesn't supply any way to change the font it uses to label icons. But that doesn't mean you're out of luck. There are basically two places to change the font size: in SETUP.INF and in the .INI files (WIN.INI and SYSTEM.INI).

All Windows fonts are contained in font files ending with a .FON extension. (In Windows 3.1, there will also be .FOT and .TTF files for Microsoft and Apple's new TrueType fonts.) These files contain the bitmaps or instructions that constitute the fonts you see on-screen. Generally, they are loaded into memory when Windows starts up, but may also be loaded explicitly by applications when they need a certain font.

Before displaying text on-screen, applications ask Windows for fonts that match certain characteristics. Program Manager asks for a small Helvetica font to label icons in its child windows, and Windows provides Program Manager with the font you see. This small Helvetica is one of the default fonts that the Windows Setup program installs for you, based on the resolution of the display adapter you've told it you have. Unless you've changed the defaults in some way, the fonts you see on the screen are the fonts

Windows

installed by the Setup program.

Windows provides an application with the font that most nearly matches what it asks for. The trick is to tell *Windows* which fonts *you* want installed, so that it can then pass them on to the application instead of the default fonts. In this case, you wouldn't change the font Program Manager requests, you'd change the font *Windows* gives in response to that request. What you need is to have *Windows* automatically load a larger Helvetica font set, so that when Program Manager asks for a small Helvetica font, the font it actually receives will be a larger one.

As we discussed in the December 17, 1991, issue, you can modify your *SETUP.INF* file so that the *Windows* Setup program automatically installs *your* font choices, not the defaults. Setup uses this file to update the *SYSTEM.INI* and *WIN.INI* files with references to smaller or larger fonts.

If, for instance, you want Setup to install the larger 8514/A fonts on a VGA screen, change the *vga=* resolution string in *SETUP.INF*'s [display] section from "100,96,96" to "100,120,120". After saving *SETUP.INF*, run Setup to select a video adapter other than VGA, and then rerun Setup to move back to VGA so that your *SETUP.INF* change can be implemented. (You can refer to the previous column for the details.) This will have the effect of making your fonts appear 25 percent bigger ($120/96=1.25$).

Unfortunately, using this method to install larger fonts may cause another problem: Some icon bars (a.k.a. tool bars, button bars) will run off the side of the screen if they are font-based (like the *Word for Windows*' ribbon). That's because some applications calculate the size of on-screen elements based on the logical pixels per inch (ppi, which are indicated by the 96,96 or 120,120 in the resolution string) of the fonts you've installed, and not the logical pixels per inch of the display driver, while other applications, like *Excel*, do just the opposite. You don't notice this as much when you run a smaller font set on a given device (EGA fonts on a VGA, VGA fonts on an 8514/A), but you see it when you run a larger one!

So, to really solve Mr. Smith's problem, we have to be more selective in the fonts we install. That rules out using Setup

because Setup modifies *all* the font entries in the *.INI* files; it's useless for installing or changing just a single font. Instead, we have to manually change the *WIN.INI* file's [fonts] section.

Since Program Manager uses a Helvetica font, we need to change the line

```
Helv 8,10,12,14,18,24 (VGA  
res)=HELVE.FON
```

to

```
Helv 8,10,12,14,18,24 (8514/a  
res)=HELVF.FON
```

Notice that the text on both sides of the equal sign is different. The important side is the right side, though, because that's the reference to the font file itself.

HELVE.FON is the normal 96-ppi by 96-ppi Helvetica font, and HELVF.FON is the larger 120-ppi by 120-ppi version. (If you were doing this for an EGA font, you'd replace the HELVB.FON font-file reference in *WIN.INI* with one for HELVE.FON, the VGA font. You can see how the font-file names are matched up with the various resolutions by looking at the [fonts] section of your *SYSTEMSETUP.INF* file.)

If you can't find HELVF.FON in your *SYSTEM* directory, you'll need to use the *EXPAND* program (see the *Windows* *README.TXT* file for instructions) to get it (or any font file, for that matter) off of your *Windows* disks. Put the new font file in your *SYSTEM* directory, edit *WIN.INI*, and then restart *Windows*. You now have a larger Helvetica font installed, which the Program Manager will use when it makes its font request. The icon labels will be larger and more readable. And since you haven't changed the special-purpose system fonts referenced in the *SYSTEM.INI* file, your applications' icon bars won't be affected, because programs always key off the sizes of the standard system fonts.

OPENING WINDOWS

Share your *Windows* experiences with Fran Finnegan; we'll pay you \$50 for any tip we print. Mail your contribution on-disk, with a printout, to *Windows*, *PC Magazine*, One Park Avenue, New York, NY 10016, or e-mail it (re: *PC Magazine*) to: PC MagNet: 76244,145; MCI Mail: Fran Finnegan; BIX: franfinnegan; GEnie: finnegan; Internet: finnegan@well.sf.ca.us. ■

RETAILERS: DEAL YOURSELF IN



GET A FULL HOUSE OF CUSTOMERS—STOCK THE ZIFF-DAVIS COMPUTER LINE

You're playing a winning hand when you carry the Ziff-Davis line of computer magazines:

PC MAGAZINE
PC/COMPUTING
COMPUTER SHOPPER
MACUSER.

Here's your choice to build traffic. Establish your store as a full-service center. And best of all, boost sales of your inventory, while earning additional profits.

Plus—we make it easy for you to get the maximum profit from our line. You get *guaranteed* profits. Free in-store sales aids. A toll-free HELP line. And much, much more!

So follow the leader to big profits! To stock the magazines that move your stock, call:

1-800-435-5003

Or write: Frank Manzano,
Ziff-Davis Publishing,
One Park Ave. - 5th Floor,
New York, NY 10016

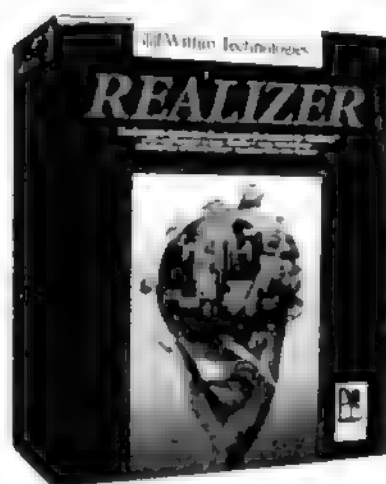
The REALIZER Challenge

1991
- FINALIST -
PC Magazine Award
for Technical Excellence



DEVELOPMENT TOOLS
Realizer
Within Technologies

Within Technologies™



REALIZER™

REALIZER was presented with the BYTE Magazine/Interface Group "Best Rookie Exhibitor" Award at the Spring 1991 Comdex/Windows World show, prompting BYTE editor Jerry Pournelle, in his September 1991 column, to write that "REALIZER looked to be a better program ... certainly easier to use ... than Visual Basic."



WINNER

"... Visual Basic may have legitimized the idea of using BASIC for Windows development, but Within's Realizer has met the competition under combat conditions and demonstrated the versatility and robustness demanded by corporate developers."

- Peter Coffee, **PC Week**
September 9, 1991

"... You've heard of Microsoft's Visual Basic, but a much more powerful environment you should try is Within Technologies' Realizer ..."

- Brian Livingston, **InfoWorld**
October 14, 1991

"... a Windows programming breakthrough ..."

- Kaare Christian, **PC Magazine**
October 15, 1991

"... no other Windows BASIC can match it for power and breadth of features ..."

- Paul Bonner, **PC Computing**
October 1991

"... light years ahead of Visual Basic in terms of compatibility and porting your old BASIC application."

- Don Crabb, **InfoWorld**
October 21, 1991

REALIZER FEATURES

- Structured superset of BASIC.
- Fast, full-featured integrated development environment with sophisticated debugging tools.
- Creates .EXE files with no royalties or runtime charges.
- Automatically creates a Windows installation disk for an application.
- **Programmable Application Tools™** such as spreadsheets, charts, animation, text editors, graphics tablets, schedulers and forms.
- Visual form design with automatic code generation.
- Access functions from languages such as C and Pascal via Dynamic Link Libraries.
- Full support for Dynamic Data Exchange (DDE) and serial communications.
- Powerful features such as custom controls and automatic array processing.
- Interactive tutorial, sample code, and full featured sample applications.
- Many advanced features such as MDI, high level printing, and the ability to read and write a wide range of text and binary file formats such as Lotus 1-2-3 and Excel.
- Extensive context-sensitive online help.

SPECIAL OFFER

Decide for yourself which is the more powerful Windows development system.

For a limited time, buy a copy of

REALIZER from

The Programmer's Shop

and get a copy of Visual Basic™

ABSOLUTELY FREE!

Call 1-800-421-8006

THE PROGRAMMER'S SHOP™

by
Sal Ricciardi

Databases

GETTING THE CURRENT DRIVE

I needed a *Clipper* function that would return the current disk drive designator. I found that I could accomplish this by using the RUN command to execute a DOS Change Directory (CD) command. Executing CD with no parameters displays the current disk drive and directory. My function, shown in Figure 1, redirects this data to a file that I then read to extract the drive letter.

Greg Washburn
South Bend, Indiana



This is a good example of extending the functionality of *Clipper* without using C or assembler. You can often do things by using your knowledge of the language to combine features in unique ways. For example, *Clipper*'s low-level file I/O functions make it easy to access output files created by redirecting DOS commands. You might find other uses for this technique.

However, even after admiring Mr. Washburn's ingenuity in getting something done without using C or assembler, I'm going to present an assembly language function to get the current drive letter anyway. Here's why:

The RUN command is the easy way out when it comes to getting certain things done in *Clipper*. But it has several disadvantages.

For one, when you execute a DOS command using RUN from within a compiled application, *Clipper* runs a second copy of COMMAND.COM, the DOS command processor, passing it a command line that consists of whatever you passed to the RUN command. For example, when you use RUN CD, *Clipper* executes COMMAND.COM and passes it the CD command. This "secondary" copy of COMMAND.COM cannot be run successfully unless you have enough memory available for it.

Depending on your version of DOS, the memory requirement can vary; for DOS 3.2 it was 27K. This requirement is

■ GETTING THE CURRENT DRIVE: Retrieve the current disk drive letter in *Clipper* and *dBASE*.

above and beyond that already needed for your compiled application. If the memory is not available, whether it's because

your client has installed every TSR on the market or because your application is, shall we say, robust, the command will fail. Sometimes it will fail gracefully, other times it will not. Furthermore, COMMAND.COM must be in the directory specified by the COMSPEC environment variable in order for the RUN command to succeed. If for some reason it is not, the command will fail.

The RUN command also has a tendency to wreak havoc with the screen

CDISK.PRG

COMPLETE LISTING

```
*****
* CDISK.PRG                      Contains CURDISK() UDF for Clipper S87
* Demonstrates use of CURDISK() Clipper UDF.
*****
?
? "Current Disk Drive -> " + CURDISK()
?
RETURN

*****
* CURDISK() - Get current disk drive letter.      UDF for Clipper S87
*****
FUNCTION CURDISK
PRIVATE xRetVal, xHandle1, xRow, xCol

    xRow = ROW()
    xCol = COL()
    RUN CD > TMP.
    xHandle1 = FOPEN("TMP.",0)
    xRetVal = FREADSTR(xHandle1, 2)
    xRetVal = IIF(":" $ xRetVal, xRetVal, "")
    FCLOSE(xHandle1)
    ERASE TMP.
    @ xRow, xCol SAY ""

    RETURN xRetVal

*****
** save cursor position, row
** and column
** run "CD" redirected to a file
** open file
** read first 2 chars
** check for error
** close file
** erase file
** restore cursor position
```

Figure 1: This user-defined function uses *Clipper*'s low-level file input/output functions and the RUN command to determine the current drive letter.

CURDRI.ASM

1 OF 2

```
*****
; CURDRI.ASM                      Clipper .OBJ to get the current drive letter
; Author...: Sal Ricciardi
;
; Usage:  cdrive = curdrive()
;
; Create .OBJ with:  TASM curdri  (Borland Turbo Assembler 2.5)
;
; To link into your Clipper 5 app:
;   RLINK FILE yourapp.obj, CURDRI.OBJ LIB CLIPPER, EXTEND
;
; To link into your Clipper Summer 87 app:
;   PLINK86 FILE yourapp.obj, CURDRI.OBJ LIB CLIPPER, EXTEND
;
```

Figure 2: The assembly language source code for the CURDRI.OBJ file, which contains the curdrive() function. This function returns the current drive letter in *Clipper* S87 or 5.0.

Databases

```

CURDRI.ASM
*****
.MODEL LARGE
EXTRN _retc:FAR
PUBLIC curdrive
.DATA
odrive db 7 ;one byte for drive letter
.CODE
curdrive PROC FAR ;entry point
push ax ;save registers
push bx
push cx
push dx
push es
mov ah,19h ;get current drive
int 21h ;dos interrupt
add al,'A' ;convert number to letter
mov cdrive,al ;store in cdrive
push ds ;push FAR pointer to
mov ax,OFFSET cdrive ;cdrive
push ax
call _retc ;post Clipper return value
add sp,4 ;adjust the stack
pop es ;restore registers
pop dx
pop cx
pop bx
pop ax
ret ;return to caller
curdrive ENDP
END

```

```

CURDR.ASM
*****
CURDR.ASM Get Current Drive Letter DBASE .BIN
Author...: Sal Ricciardi
Create with: TASM curdrive (Borland Turbo Assembler 2.5)
             TLINK curdrive
             EXE2BIN curdrive
             DEL CURDR.OBJ
             DEL CURDR.MAP
             DEL CURDR.EXE
Usage: (dBASE III Plus, FoxBASE+, dBASE IV)
.cdrive = ''
.LOAD CURDR
.CALL CURDR WITH cdrive ;& Don't forget the parameter
.RELEASE MODULE CURDR
*****
.MODEL SMALL
.CODE
curdr PROC FAR ;entry point
push ax ;save registers
mov ax,ds ;try to check for
or ax,bx ;missing parm
jz @01 ;jmp if ds==0
mov ah,19h ;get current drive
int 21h ;dos interrupt
add al,'A' ;convert number to letter
mov BYTE PTR ds:[bx],al ;store in parameter
@01: pop ax ;restore register
ret ;return to caller
curdr ENDP
END curdr

```

Figure 3: The assembly language source code for CURDR.BIN, a dBASE callable routine to determine the current drive letter.

display, cursor position, and the like, depending on what command it's trying to run. Another problem is that it's somewhat difficult to pass data to and from a program executed via the RUN command.

In general, this description of the RUN command holds true for other dBASE-like implementations. However, assembly language functions built using the Clipper Extend system, or using the LOAD and CALL interface available with

other dBASE-compatible languages, have none of the above limitations.

The Clipper curdrive() assembly language function shown in Figure 2 requires only 264 bytes, and executes much faster, too. You can use it in your Clipper programs like this:

```

cdrive = curdrive()
? 'Current drive: '+cdrive+';'

```

or

```

? 'Current drive: '+curdrive()+';'

```

Figure 3 shows a .BIN version for users of dBASE III Plus, dBASE IV, FoxPro, and any other dBASE-compatible implementation that supports the dBASE III Plus LOAD and CALL interface conventions. To use it in dBASE III Plus, for example, you type:

```

.cdrive=''
.LOAD curdr
.CALL curdr WITH cdrive
.RELEASE MODULE curdr
.?
.? 'The current drive is
'+cdrive+';'
.?

```

Avoid using the RUN command for tasks that can be accomplished any other way, especially in applications that will be compiled and distributed. The RUN command requires too much memory, relies on the COMSPEC environment setting (therefore lessening your control over the execution environment), runs slower because it must load COMMAND.COM (which itself may have to load the DOS program you request), and does not save and restore your screen environment. Think of the RUN command as fat and slow, and assembly language functions as lean and fast.

LET US HEAR FROM YOU

Share your database experience, tips, and techniques; we'll pay you \$50 for any submission we print. Mail your submission on-disk, accompanied by a printout, to Databases, PC Magazine, One Park Avenue, New York, NY 10016; or upload it to PC MagNet (see page 10 for access instructions). You may also contact Sal Ricciardi via PC MagNet, mailbox 72241,33. We regret that we are unable to acknowledge submissions or answer questions individually. ■

by
Craig Stinson

Spreadsheets

PRINT WIDER THAN 240 CHARACTERS

Is there a way to print a *Lotus 1-2-3* (or other) spreadsheet beyond the 240-character width that software vendors seem to think is our limit? Most new printers offer compressed fonts that can generate 270 characters or more on a line on standard 11- by 14-inch paper. With the 240-character limit, at least 32 characters—or 1.6 inches of paper—are lost.

I have already written *Lotus* and other vendors for help with this problem and have received no response. Can you answer this simple question?

Steve Palmer
Muscatine, Iowa

PC Yes. And yes, you can print beyond the erstwhile 240-character limit. What you need is either a graphical spreadsheet (such as *Microsoft Excel*, *Lotus 1-2-3/W*, or *Wingz*) or a spreadsheet with "publishing" features. *Quattro Pro*, with its WYSIWYG option, will do fine. So will *1-2-3*, Release 2.2, 2.3, 3.0, or 3.1. You can also use *1-2-3*, Release 2.01 with a publishing add-in—*Allways* or *Impress*.

With all of these spreadsheets, the number of characters that you can fit on a printed line is determined by the size of the smallest available font. Using a 4-point font in *Microsoft Excel*, I was able to cram 360 nearly unreadable characters per line on a standard page in landscape orientation. All of the other programs managed a minimum of 275 characters when printing at either 5 or 6 points.

Quattro Pro also offers a handy "banner" option that lets you print in landscape orientation across the page boundaries on fanfold paper. This command is available for dot matrix and ink jet printers only.

■ **PRINT WIDER THAN 240 CHARACTERS:** There are ways to print spreadsheets with margins wider than 240 characters.

■ **HISTOGRAMS IN EXCEL:** Since *Excel* lacks a frequency-distribution command like *1-2-3's* /Data Distribution, this macro does the job.

HISTOGRAMS IN EXCEL

As a college professor, I often find use for histograms, both for grading classes and other graphical output. *Excel* lacks the facility to quickly and simply create histograms (also called *frequency distributions*). I finally wrote the macro in Figure 1;

it permits me to create a histogram for any column of data.

To use this macro, highlight the column of data and press Ctrl-H. The macro moves to the first column of data, skips a column, and prompts you for the increments to use in the distribution. I have made allowances for values below the lowest input value and above the highest one, so I recommend avoiding 0 as the lowest value you enter. Rather, enter the first increment above 0 that you plan to use. If you do use 0, the macro creates a redundant $0 < X = 0$ range.

The macro determines the number of values in the selected block that occur in each interval and enters them on the sheet. Then it goes to the copied block and deletes the column, leaving only the frequency-distribution data. To create the histogram, you just highlight the two columns of frequency data and open a new chart window.

I've set up the macro so that a number that exactly equals one of the incremental

HGRAM.XLM		1 OF 2
	A	B
1	Histogram, John D. Winter, Whitman College, Walla Walla, WA	Ctrl-H (highlight block before cell)
2	=COPY()	copy highlighted block
3	=SELECT("rc(-1)*)	
4	=SELECT.END(2)	move to last column
5	=SELECT("rc(2)*)	move right 1 col
6	=PASTE.SPECIAL(3,1,FALSE,FALSE)	copy block
7	=SORT(1,"rc",1)	unnecessary
8	=SELECT("r(-1)c")	
9	=WHILE(ACTIVE.CELL()<>"")	
10	=SELECT("r(-1)c")	
11	=NEXT()	
12	=SELECT("rc(1)*)	
13	=INPUT("Enter the low range (not 0):",1,"Range-Increment Input")	
14	=INPUT("Enter the high range:",1,"Range-Increment Input")	
15	=INPUT("Enter the increment:",1,"Range-Increment Input",10)	
16	count=1	
17	=FOR("x",A13,A14,A15)	loop for intervals
18	count=count+1	
19	=SELECT("r(1)c")	
20	=IF(count=0,GOTO(A23),GOTO(A21))	
21	lval=A13+(count-1)*A15	set low value in loop
22	=GOTO(A24)	
23	hval=0	set low = 0 if first loop
24	hval=A13+count*A15	set high value in loop
25	=FORMULA(lval&"< X =< "&hval)	enter range in cell

Figure 1: An *Excel* macro that determines the frequency distribution of a group of numbers you define. You can easily create a histogram from its results.

HGRAM.XLM		2 OF 2
	A	B
26	=SELECT("r3c(-1)")	count # of values in range
27	cval=0	
28	=WHILE(Active.Cell()<>"")	
29	=IF(Active.Cell()>lval,GOTO(A30),GOTO(A33))	
30	=IF(Active.Cell()<hval,GOTO(A32),GOTO(A31))	
31	=IF(Active.Cell()=hval,GOTO(A32),GOTO(A33))	
32	cval=cval+1	
33	=SELECT("r(1)c")	
34	=NEXT()	
35	=SELECT("r3c(2)")	
36	=IF(Active.Cell()="",GOTO(A39),GOTO(A37))	
37	=SELECT("r(1)c")	
38	=GOTO(A36)	
39	=FORMULA(cval)	print # of values in range
40	=SELECT("rc(-1)")	
41	=NEXT()	
42	=SELECT("r(1)c")	
43	lval=A14	
44	hval=10000000	
45	=FORMULA(">"&lval)	determine # of values above high
46	=SELECT("r3c(-1)")	
47	cval=0	
48	=WHILE(Active.Cell()<>"")	
49	=IF(Active.Cell()>lval,GOTO(A50),GOTO(A52))	
50	=IF(Active.Cell()<hval,GOTO(A51),GOTO(A52))	
51	cval=cval+1	
52	=SELECT("r(1)c")	
53	=NEXT()	
54	=SELECT("r3c(2)")	
55	=IF(Active.Cell()="",GOTO(A58),GOTO(A56))	
56	=SELECT("r(1)c")	
57	=GOTO(A55)	
58	=FORMULA(cval)	
59	=SELECT("c(-2)")	delete data column
60	=EDIT.DELETE()	
61	=SELECT("r1c")	
62	=COLUMN.WIDTH(14,"c",3)	adjust width of interval column
63	=FORMULA("Frequency Distribution")	
64	=RETURN()	

stricting placement of the input values, the macro is slow. Its modus operandi is to traverse the input range once for each distribution bin. Since the data cells are copied and sorted before being evaluated, it would be possible to speed the macro up considerably by interrupting each trip through the input range at the point where the current value exceeds the high end of the current bin.

But there's a much simpler approach to this problem. With a set of array formulas, you can let *Excel* do the range walking internally. If your input range is named SCORES and you want to know the number of scores that fall in the range $10 <= x < 20$, you can write this array formula:

`(=SUM((SCORES>=10)*(SCORES<20)))`

When entering this formula, do not type the braces. Type everything else normally, then press Ctrl-Shift-Enter to complete the formula. *Excel* adds the braces automatically. (If you enter them manually, *Excel* treats the whole thing as text.) Also, if you edit the formula later, be sure to press

values falls into the lower of the two possible ranges. If you want to change this convention, modify the IF statements in A29:A31 and the text in A25.

If you are using the rightmost column of a data block as the source for the histogram, the macro will use the very right end of the worksheet as its work area—quite a distance from the area of interest. To fix this, the macro moves a column to the right before beginning the last-column search, but this results in a mess if your data is in the leftmost column of a block. Since most of us put our row names in the first column, this isn't usually a problem. If you don't do this, I suggest you leave the first column blank.

John D. Winter

Walla Walla, Washington

PC *Excel* has no straightforward frequency-distribution command comparable with 1-2-3's /Data Distribution. Microsoft's support people occasionally refer users to the CROSSTAB.XLA add-in macro supplied

in the *Excel* 3.0 package. But CROSSTAB.XLA is hard to find (the Setup program puts it in your Q+E direc-

In *Excel*'s internal calculus, TRUE times TRUE is 1, but TRUE alone has no value.

tory, not in *Excel*'s own macro library), is poorly documented (the only information—hidden away in the Help file for the macro library—is much too sketchy to be useful), and is really designed for two-variable cross-tabulation, not for simple frequency distributions.

Mr. Winter's macro is one way to redress *Excel*'s deficiency, but it has a few problems of its own. In addition to re-

Ctrl-Shift-Enter again when you finish. *Excel* removes the braces as soon as you begin editing, and you must use the special keyboard combination again to signal the formula as an array. If you forget to do this (it's easy, believe me), you can lose a lot of time trying to figure out why your carefully constructed formula no longer returns anything meaningful.

Here's how the formula works:

For any given member of the numerical set SCORES, the propositions SCORES>=10 and SCORES<20 return some combination of the logical values TRUE and FALSE. In *Excel*'s internal calculus, TRUE multiplied by TRUE yields 1—you can verify this by writing the formula =TRUE()^2—and TRUE multiplied by FALSE yields 0. Thus, for each member of the set, the expression (SCORES>=10)*(SCORES<20) generates a 1 or a 0. Note that the parentheses are required; the multiplication operator has higher precedence than the comparative operators, so you'll get different results if you leave out the parentheses.

Spreadsheets

HGRAM2.XLM		COMPLETE LISTING	
			PC MAGNET
1	Create histogram (h)		
2	Select a range to evaluate, then press Ctrl-h		
3	=DEFINE.NAME("input_range")		
4	=INPUT("Low end of range: ",1,"Distribution Setup")		
5	=INPUT("High end of range: ",1,"Distribution Setup")		
6	=INPUT("Interval: ",1,"Distribution Setup")		
7	=SELECT.LAST.CELL()		
8	=SELECT("r1c1")		
9	=SET.NAME("BinValue",A4)		
10	=FOR("x",A4,A5+A6,A6)		
11	= FORMULA(BinValue)		
12	BinValue=BinValue+A6		
13	= SELECT("r1c")		
14	=NEXT()		
15	=ROW(SELECT.ION())		
16	=SELECT("r1c1")		
17	=FOR("x",1,A15-2,1)		
18	= FORMULA.ARRAY("=sum((input_range=r1c1-1)*(input_range-r1c1-1))")		
19	= SELECT("r1c")		
20	=NEXT()		
21	=SELECT("r1c1:r1c")		
22	=COPY()		
23	=PASTE.SPECIAL(3)		
24	=SELECT.END(4)		
25	=SELECT(REFTEXT(SELECT.ION())&"r1c1-1")		
26	=NEW(2,2)		
27	=RETURN()		

Figure 2: This macro creates a histogram from a group of numbers. It is much smaller than the macro in Figure 1 because it uses an array formula to categorize the numbers.

Enclosing the expression within a SUM() function and converting the whole thing to an array formula tells *Excel* to evaluate the formula's guts for *each* member of SCORES and return the total—in other words, to tell us how many values are at least 10 and also less than 20. Now, to generate your histogram, you can either enter a set of similar formulas manually, or you can build a macro to do it for you.

Figure 2 shows one way to do it with a

macro. Like Mr. Winter's macro, it expects you to select the input range and then press Ctrl-H. You'll be prompted for three values—the lowest number in the range, the highest number, and the interval by which you want your frequency bins separated. For example, if your numbers range from 0 to 100 and you want one histogram bar for each interval of ten, enter 0, 100, and 10 in response to the three prompts. Note that you are not restricted to entering an even divisor as

the interval; you can specify 0, 100, and 9.7 if you wish.

The macro then finds the spot in row 1 that is just to the right of the last cell your worksheet is currently using. There, it creates the appropriate bin values and frequency-distribution formulas. The last formula catches any values that happen to be exactly equal to the high end of the range.

After generating the frequency distribution, the macro uses Copy and Paste Special to convert the values from formulas to constants. It does this so that you can reuse the macro with a new set of input values in the same worksheet. If you'd prefer to keep the results as formulas, delete rows 22 and 23. Finally, the macro selects the two-column output range and creates a simple bar chart as shown in Figure 3.

One final comment about the use of logical expressions in array formulas. While TRUE()*TRUE() does indeed equal 1 in *Excel*, TRUE() by itself has no numeric value. If you want to count values meeting only one logical condition, the formula

{=SUM(range=value)}

won't do. This formula will give you 0 no matter what numbers are in the range. Instead, you have to write

{=SUM((range=value)*1)}

It seems inconsistent that TRUE squared equals 1 but TRUE by itself does not. The explanation is that *Excel* automatically performs certain type conversions to give you more flexibility in designing formulas. TRUE is a logical value, not a number. But when *Excel* sees an arithmetic operator next to TRUE, it converts TRUE to 1—just as it converts the text value 2 to the number 2 if you use it in an arithmetic formula. No operator, no conversion.

HINTS, TIPS, QUESTIONS

Share your latest spreadsheet discovery through *PC Magazine's* Spreadsheets. We'll pay you \$50 for any tip we print. Please submit your letter on-disk, together with a printout. Mail your contribution to Spreadsheets, *PC Magazine*, One Park Avenue, New York, NY 10016, or upload it to PC MagNet (see page 10 for access instructions). We regret that we are unable to acknowledge submissions or answer questions individually. ■

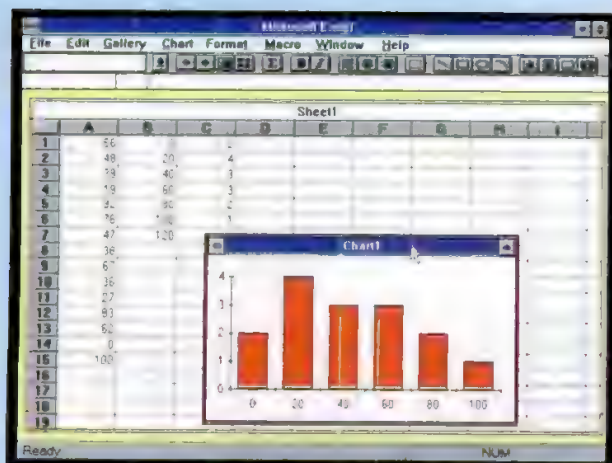


Figure 3: This histogram was created using the macro in Figure 2. You can see the frequency-distribution bins to the left of the graph.



Make PC MAGAZINE Come Alive!

Join PC MagNet and have instant access to PC MAGAZINE's programs and product reviews.

PC MagNet is *PC MAGAZINE's* on-line information service, which is administered by CompuServe. A PC MagNet account gives you:

- Access to all of *PC MAGAZINE's* utilities and programs
- The latest PC Labs Benchmark tests
- New versions of *PC MAGAZINE's* utilities
- A way to talk directly with *PC MAGAZINE* editors and columnists
- On-line support for our programs in the forums
- Direct entry to the Computer Library family of databases
- A downloadable-index to *PC MAGAZINE's* product reviews

One call gets you started!

Sign up on-line at no additional charge.

1. To subscribe, set your communications software for either 300, 1,200 or 2,400 bps, 7 data bits, even parity, 1 stop bit, and full duplex. To find the number nearest your dialing exchange, dial (800) FIND CIS (346-3247). When the modem connects, press <Enter>. At the HOST NAME prompt, enter PHONES. Follow the menus and note the number closest to you. After you have found the phone number, hang up and dial using the number you just found.
2. When you receive a CONNECT or CARRIER DETECTED message, enter **Ctrl-C**.
3. At the HOST NAME prompt, enter **CIS**.
4. At the USER ID prompt, enter **177000,5000**.
5. At the PASSWORD prompt, enter **PC*MAGNET**.
6. At the Enter agreement number prompt, enter **Z10D9000**.
7. Register your name and enter your **VISA**, **MasterCard**, or **American Express** account number. You may choose to have your company billed directly by choosing Business Account Invoicing. For more information about Business Account Invoicing, call (800) 848-8199.
8. Your personal **User ID** number and **Password** will be displayed at the end of the subscription process. Please record them in a secure place.
9. A new password will arrive in the mail within 10 days to confirm your subscription.

There are no connect charges for PC MagNet during the subscription process. PC MagNet costs \$12.80 an hour for 1,200/2,400-bps service and \$6.30 for 300-bps, via MasterCard, VISA, or American Express. For assistance regarding passwords, membership, billing or payment terms, call Customer Assistance at (800) 848-8990; outside the United States, call (614) 457-8650. There are no upfront subscription fees, or monthly charges. You pay only for the time spent on-line.

CompuServe members can join by entering GO PCMAG at any CompuServe prompt.



CIRCLE 497 ON READER SERVICE CARD

by
M. David Stone

The Working Word

WYSIWYG REVISITED

In the June 11, 1991, Working Word column, Eddie Nicholson points out that *Word for Windows* "seems to be only somewhat WYSIWYG," (what you see is what you get). More specifically, he complains that few of the on-screen fonts reflect actual printer output, which makes the ruler virtually useless as a formatting tool.

In response, Costa Rodis discusses the match between the screen and the printed page in *Word for Windows*, *Microsoft Word 5.0*, and *WordPerfect 5.1*. In each case, he concludes that the correlation between screen and printer is imprecise for at least some typefaces.

Missing from this discussion is any mention of *WordStar*, Version 5.5 or 6.0—a serious oversight. While *WordStar* text input isn't achieved through a GUI, the program has an Advanced Page Preview feature that you can readily toggle to and from during editing. The page preview shows how the printed page will look. It also offers several levels of enlargement and a grid that helps you verify placement.

■ **WYSIWYG REVISITED:**
Our new master wordsmith explains how a word processor's editing screen can match printer output exactly.

And while you're editing with the screen in text mode, the *WordStar* status line accurately reports the printout measurements for the cursor position.

Robert Cammer
Larchmont, New York



It's true that *WordStar*'s page preview provides a close on-screen approximation for what you'll see on the printed page, as do the preview features in *Word* and *WordPerfect*. It's also arguable that *WordStar 5.5* provides the most useful preview feature among text-based word processors, with more options than either *Word* or *WordPerfect*. But even the best preview feature comes up short when compared with true WYSIWYG.

Previewing a page on-screen is not very different from printing. Without page preview, the all-too-familiar approach to complicated formatting is to print, make corrections, print again, and repeat until you're satisfied.

The page preview feature changes this chore only to the extent that you print to screen instead of to paper. The process is faster than actual printing, but it still leaves you repeatedly fixing and checking your format. The promise of WYSIWYG is that you can see the results as you work.

And that can turn complicated formatting into a straightforward, truly intuitive task.

Unfortunately, as Mr. Nicholson pointed out in his letter, *Word for Windows* isn't really WYSIWYG. Yet the problem is not with *Word*, but with *Windows*. There are several factors that contribute to the problem, and most of them are not widely understood. More important, there are fixes. To understand the fixes, you first have to understand the problem. For brevity's sake, I'll only discuss issues that apply to laser printers.

WHAT YOU SEE ISN'T WHAT YOU GET

The underlying problem is the one that was mentioned almost in passing in Mr. Rodis's response: the difference between screen and printer fonts. However, this seemingly simple phrase hides a complicated web of interrelated issues.

The primary issue is that your system uses a different set of fonts for screen and printer. With a text-based word processor, this is immediately obvious. When you print with Times Roman, Helvetica, or even Courier, the monospaced font you see on your screen bears no resemblance to the font that comes out of the printer.

Less obvious is that your system uses different fonts for screen and printer even in a program like *Word for Windows*, where the screen font more or less matches the font in the printer. The issue then becomes one of getting an exact match between the two sets of fonts. Anything less yields less than WYSIWYG. As the saying goes, the devil is in the details.

Assuming you have a laser printer or equivalent, with its own set of built-in fonts, you probably have a close approximation between at least some of your screen and printer fonts. To find out how close, first go to the Fonts choice on your *Windows* Control Panel. As shown in Figure 1, you can see a list of the currently installed screen fonts, along with samples of how those fonts look.

Next, you need a list of your printer fonts, including the resident fonts, fonts

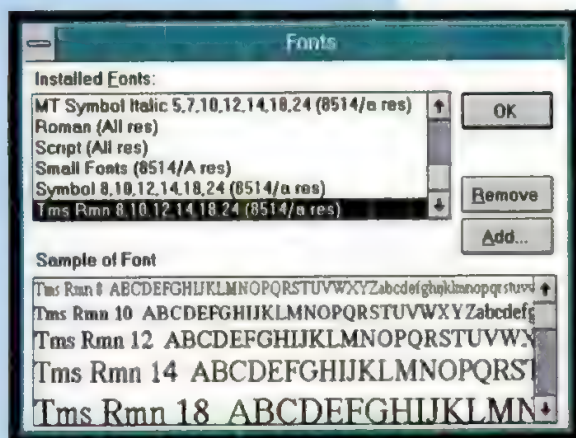


Figure 1: The Fonts choice on your *Windows* Control Panel shows a list of the screen fonts currently installed, along with samples of how these fonts look.

Working Word

on cartridges, and any downloaded fonts. If you don't already know the fonts in your printer, you can check your printer manual, or have the printer print out a list for you.

If you have an HP LaserJet II, for example, you can get a list of fonts currently in the printer by taking the printer off-line and pressing the Print Fonts/Test button. If you have an Adobe PostScript printer, you should have an option that will print a start page when you turn on the printer. The start page will include a list of fonts. Most other page printers have equivalent features.

In general, there are two kinds of fonts: *bitmapped* and *outline*. With bitmapped fonts, each character is individually designed for each font size. With outline fonts, also called *scalable* fonts, all font sizes for any given character are generated from a single algorithm.

If your printer uses bitmapped

fonts—as with the HP LaserJet II and most LaserJet compatibles—the font list will include a separate font for each point size, and you will be limited to the sizes on the list. If your printer uses outline fonts—as with Adobe PostScript, PostScript-compatible printers, the HP LaserJet III, and the Canon LBP 8-III and LBP 4—the list will only include font names, since you can scale the font to any font size you want.

Once you have lists of both screen and printer fonts, you can compare the two to see where they match. In general, any font name and size that shows up in both lists should yield a close match between screen and printer. And any printer font that does *not* match both a name and size on the screen font list will not yield WYSIWYG printing.

You can see the truth of this statement quite clearly in Figure 2, which shows both the standard *Word for Windows* screen and the printed text that results from that screen. The 10-point, 18-point, and 24-point text—all of which are available as screen fonts—all match the printed

page. Only the 48-point text shows little resemblance between screen and page.

Note that *Word* calculated the line break correctly for the 48-point text in Figure 2. But according to the ruler, the line is 2.5 inches long, instead of its actual size of about 5 inches. Note also that *Word* is showing the 48-point text, which is not an available screen font, as being exactly the same width as the 24-point text, which is an available font.

The basic rule, then, is that matching screen and printer fonts yield true WYSIWYG. Nonmatching pairs do not. But there are other factors you need to keep in mind.

A minor complication is that most font names are registered trademarks, though the fonts themselves can be re-created as “new” designs. As a result, you’ll find that Dutch fonts, for example, are essentially indistinguishable from Times Roman, and Swiss is essentially indistinguishable from Helvetica. But to take advantage of these matches, you have to know which fonts match which. Here’s a list of the five most popular pairs:

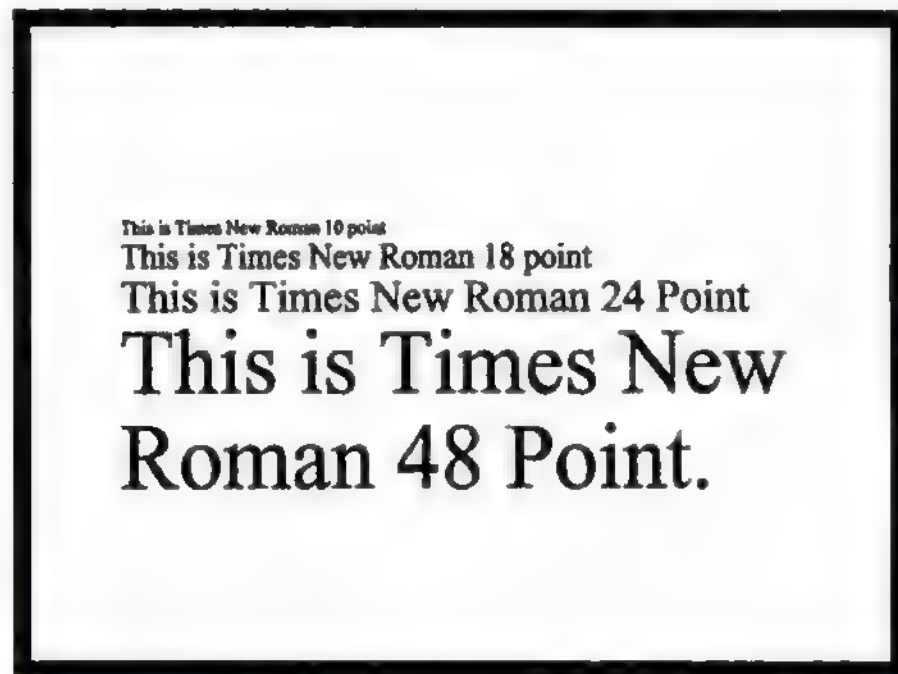
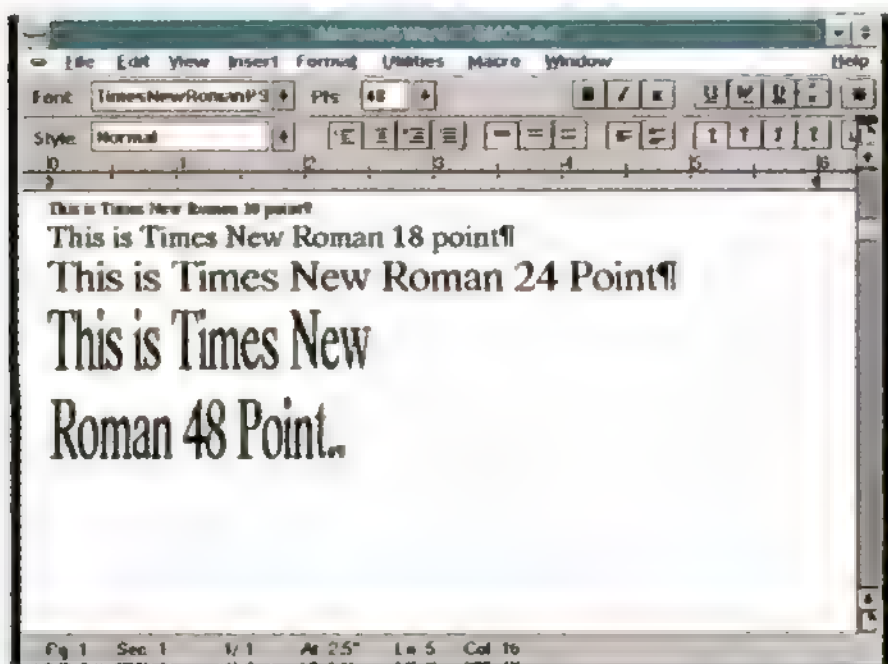
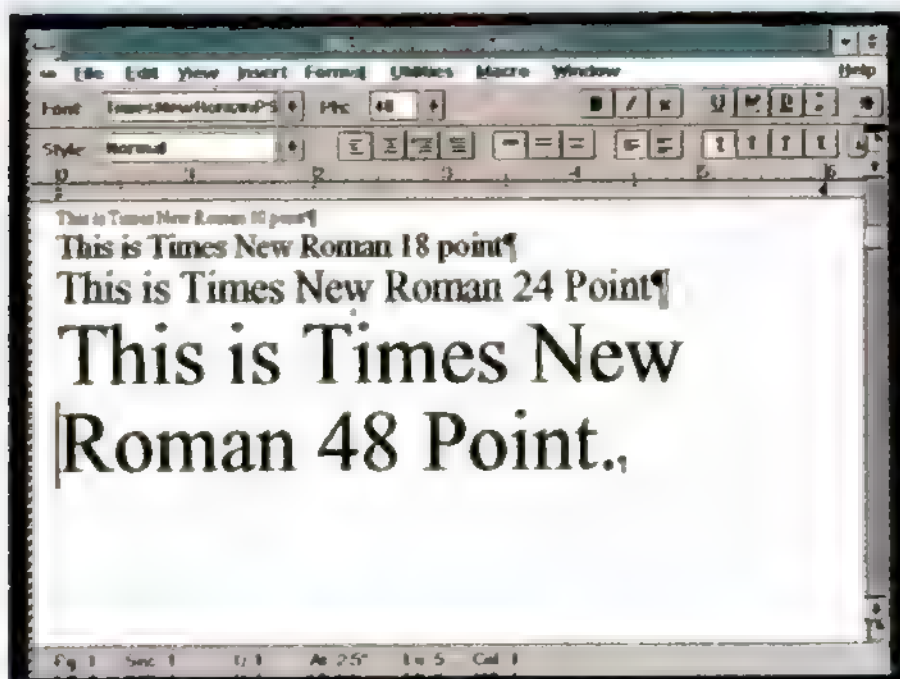


Figure 2: Two *Word for Windows* screens that produce the same printed output, shown at the top right. The difference between them shows the value of matching screen fonts to printer fonts. The screen in the upper left uses the *Windows* 3.0 default fonts. Note that the lines break at the correct word, even though the screen doesn't show the actual width of the lines. The screen in the lower left uses the scalable fonts in *Adobe Type Manager* to closely match the screen to the printed page.





DISTRIBUTOR WANTED

NOW YOU NEED IT

Geo NB900

NOTEBOOK COMPUTER

(CIRCLE 200 ON READER SERVICE CARD)



GREAT EUROPE-ASIA CORP.

10F, NO. 126, SEC. 4, NAN-KING EAST ROAD, TAIPEI, TAIWAN

P. O. BOX 81-140 TAIPEI

TEL: 886-2-7713122

FAX: 886-2-7513533, 886-2-7400800

TLX: 13883 GEATPETH, 13904 GEATPETH

KEY: 10000 GEATPETH, 10001 GEATPETH

Working Word

Times Roman	--	Dutch
Helvetica	--	Swiss
Palatino	--	Zapf Calligraphic
Optima	--	Zapf Humanist
Univers	--	Zurich

(Note: All fonts listed are trademarks, but of different companies.)

A more serious issue is that two fonts that look virtually identical do not necessarily yield an exact match. Even a small discrepancy in font width between two designs can yield a difference in where a line breaks, for example. In general, these discrepancies have more effect on the interchangeability of files among systems than on WYSIWYG for a given system. But the discrepancies can become an issue if *Windows* doesn't have a driver for a given printer, so that you have to install it for a compatible printer instead.

For example, a PostScript-compatible printer may generate characters that occasionally yield different line breaks than Adobe PostScript. If such differences exist

with your printer, they will likely show up if you've installed the printer as one of the Adobe PostScript choices.

(Still other complications show up with dot matrix printers, as William S. Hall discussed in the February 12, 1991, *Windows* column.)

WHAT YOU SEE IS WHAT YOU GET

Given that the lack of WYSIWYG comes from a lack of one-to-one correspondence between screen and printer fonts, the solution is obvious: Match your screen fonts to your printer fonts. The screens in Figure 2 are two versions of the same *Word For Windows* screen. Both of these have the same file loaded, but the 48-point text matches the printed page in only one of the screens. The screen that matches is using *Adobe Type Manager (ATM)*.

ATM, which is compatible with Adobe Type 1 fonts, lets you work with outline fonts on-screen. Because the program generates characters using the same algorithm as PostScript printer fonts, the screen fonts should be an exact match for Adobe PostScript printers. When working with the HP LaserJet and compatibles, *ATM* gives you the choice of using the fonts

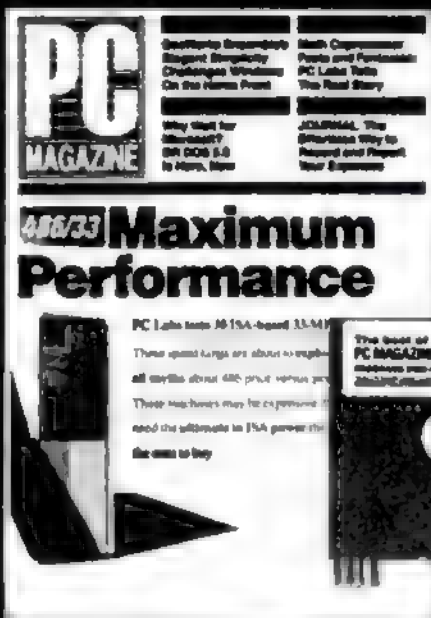
already in the printer or sending a graphics image of the page to the printer. The printer fonts yield faster output, whereas the bitmapped image yields an exact match between screen and printed page.

Besides *ATM*, note that Bitstream provides a similar package called *FaceLift*. *FaceLift* currently uses only Bitstream's own fonts. However, the company says that Version 2.0 will support PostScript Type 1 fonts. Also note that Microsoft promises to add a similar capability to the next upgrade of *Windows*, under the name *TrueType*. Bitstream says that the next version of *FaceLift* will support *TrueType* fonts as well.

TIPS FROM WORKING WORDSMITHS

Tell the Working Word your latest word processing discovery; we'll pay you \$50 for any tip we print. Please send your contribution on-disk along with a print-out to The Working Word, *PC Magazine*, One Park Avenue, New York, NY 10016, or upload it to PC MagNet (see page 10 for access instructions). We regret that we are unable to acknowledge submissions or answer questions individually. ■

GET NONSTOP
SYSTEMS
INFORMATION
— AND 2 DISKS
FREE!



PC MAGAZINE is the one publication you can trust to keep you up-to-date on the latest developments in the ever-changing world of computing.

Subscribe now to make sure you don't miss a single product report or productivity-enhancing tip.

■ One year (22 issues) for \$29.97.
SAVE 54%.

■ Two years (44 issues) for \$49.97.
SAVE 62%.

And if you order now, you'll also get our exclusive 2-DISK "BEST OF PC MAGAZINE'S UTILITIES"—FREE with your paid subscription!

Don't delay. Call toll-free today to claim your savings and FREE "BEST OF PC MAGAZINE'S UTILITIES!"

1-800-289-0429

Please add \$32 per year for postage outside the U.S., U.S. currency only. Canadian GST included. Please allow 30 days for delivery. Disks will be shipped upon payment.

by
Neil J. Rubenking

User-to-User

FASTER BOOTING

When I turn on my computer or reboot, the BIOS wants to read a floppy disk in drive A: even though my machine boots from a hard disk. It takes several seconds before the BIOS discovers that there's no disk in drive A:, then it goes ahead to boot from the hard disk. This really annoys me, so I found a simple solution: Copy the hard disk's boot sector to a floppy disk's boot sector. Here's how to do it:

- Put a formatted floppy disk in drive A:. The disk may contain some files or be empty; it doesn't matter because there's no need for the system files or batch files.
- At the DOS prompt, start DEBUG. You'll see the hyphen prompt, meaning DEBUG is waiting for a command.
- Now enter these three lines:

```
L100 2 0 1
W100 0 0 1
Q
```

The first line loads data to memory location 100 from drive C:, sector 0, for a length of 1 sector. The second line writes the memory contents from location 100 to drive A:, sector 0, for a length of 1 sector. The third line quits DEBUG.

That's it: Now you have a special floppy disk to put in drive A: anytime you boot. The BIOS will read the floppy disk's boot sector, instantly jump to the hard disk, and continue from there. Put a label on it reading "Hard Disk Speed Boot" so you'll always know which disk to use.

R. Vaillancourt
Kingston, Ontario
Canada

PC You'll have to try this one yourself to see if it actually speeds booting up your particular system or if it even works on your system. On my 386 clone, it didn't make any appreciable difference. But on my original IBM PC, it halved the time interval between rebooting and seeing the output of the first driver from CONFIG.SYS.

- **FASTER BOOTING:** Create a special floppy disk to speed your system's boot-up.
- **ADDING COMMENTS TO BATCH FILES:** Here's a clever way to add extensive comments to batch files with minimal speed loss.
- **EASIER FILE MANAGEMENT:** This simple batch file lets you review the files you've worked on since your last backup.

If your system boots from a hard disk drive other than C:, you'll have to change the L100 line in the DEBUG instructions. In the existing line—L100 2 0 1—the 2 indicates drive C:. If you boot from drive D:, use 3; from drive E:, use 4, and so on.

Note though that having files on the floppy doesn't prevent this process from working, you will lose access to those files after the first time you boot with it. Do be sure to mark the "speed boot" disk very clearly, and don't ever boot with it in a machine other than the one for which it was created. Results are unpredictable if you boot with this disk on a machine whose boot sector doesn't match it.

ADDING COMMENTS TO BATCH FILES

Your Lab Notes column "Sharpening Your DOS Batch File Programming Skills" in the January 30, 1990, issue was very interesting. It cleared up several fuzzy areas in my understanding of the batch language, and the programming examples were quite clever.

However, I believe I've come up with a

solution (to the problems involved in commenting batch files) that is superior to any of the methods mentioned in your article. I just insert a block of text into my batch programs wherever I want by making it invisible to the program. Typically, I make the second instruction in a batch program (after @ECHO OFF) GOTO START and the third instruction the label :START. I then insert any text I want to include between these two instructions.

This eliminates the delay associated with processing REM statements, avoids the labor and additional file formation involved in using your REMFREE.BAT program, and ensures that the documentation is always with the program. As a bonus, the text can be edited much more simply than blocks of text in which every line has to begin with REM. Finally, I find a narrative description of a program's functions more comprehensible than comments dispersed throughout the body of the program, at least in the case of short files. In a long program, of course, this approach would be more useful as an adjunct to line-by-line comments. In any case, I hope you enjoy my suggestion as much as I enjoyed your article.

.Barton A. Gravatt
Homer, New York



Until I tested this, I didn't realize just how much time REM statements take in batch processing. For testing, I created SHORT.BAT, containing only the lines

```
@ECHO OFF
GOTO Start
:Start
```

I copied this to LONG.BAT and inserted about 2K of text between the GOTO line and the label Start. Next, I copied LONG.BAT to REMS.BAT, deleted the GOTO line from REMS, and added a REM at the start of every line. For timing purposes, I set the DOS PROMPT to \$t\$g, so the prompt would indicate the

User-to-User

current time. I used a FOR loop to run SHORT.BAT 25 times, then did the same with LONG.BAT and REMS.BAT. The results were amazing!

Running SHORT.BAT 25 times took roughly 9 seconds, while LONG.BAT took about 16 seconds. So there is a minor speed penalty for making DOS jump over your text. But REMS.BAT took a whopping 88 seconds! DOS can't just skip REM lines; it doesn't know a given line is a REMark until it *reads* the line. Inserting your text directly into the batch file and simply jumping over it with a GOTO is clearly more efficient than using masses of REM statements.

EASIER FILE MANAGEMENT

Before backing up my hard disk at the end of the day, I like to review the files I've created or changed since my last backup.

I use F.BAT (Figure 1), which calls upon Norton's File Attributes (FA) utility to find all files with the archive bit set and writes a list of these files to the screen. It then calls Michael Mefford's DIRMAGIC (DM) utility, so I can review the list, view ASCII files, and rename or delete files.

A. J. Moyers

Ooltewah, Tennessee

CHANGED.BAT

COMPLETE LISTING

```
@ECHO OFF
CLS
ECHO.
ECHO A search for Drive C files with an archive attribute is under way.
ECHO:
ECHO Please WAIT. I will beep when finished.
ATTRIB C:\*.* /S | FIND " A " > C:\BATCH\$.ASC
ATTRIB -A C:\BATCH\$.ASC
ECHO.
ECHO The search for Drive C files with an archive attribute is complete.
ECHO
ECHO.
PAUSE
ECHO.
MORE < C:\BATCH\$.ASC
ECHO.
ECHO If you wish to see the list again, view the C:\BATCH\$.ASC file
ECHO.
```



Figure 2: This batch file lists all files that have been created or changed since your last backup.



If you have DOS 3.3 or later, you don't need Norton's FA utility to find all files with the archive bit set. You can use the DOS ATTRIB command with the /S switch. This switch makes ATTRIB list the attributes of files in the selected directory and all sub-directories below it. Every file whose archive bit is set will generate a line containing the letter A (for archive) with a space on either side. So piping the output of ATTRIB through the FIND filter looking for ' A ' will produce the desired list. CHANGED.BAT (shown in Figure 2) implements this idea while avoiding calls to programs that aren't part of DOS.

You can actually use ATTRIB as a means to list all files on a disk that match a template. For example

```
ATTRIB C:\*.COM /S
```

will list every .COM file on drive C:. The first group of characters lists the file's attributes; the full pathnames actually begin a dozen or so characters into the line. This technique has been the basis for a number of User-to-User tips.

Starting with DOS 5.0, however, you can apply the /S switch to the DIR command to make it list matching files in the current directory or any directory below it. And DIR's new /B (for bare) switch gives you a listing that includes *only* the full pathname for each file. So the command DIR C:*.COM /B/S would give you the list of all .COM files on drive C: *without* the size, time, and date stamp or any attributes.

Note also that the DOS 5.0 ATTRIB command lets you set or clear the Hidden and System bits of a file's attribute byte. In previous DOS versions, if you wanted to change those bits you had to use a third-party utility like PC Magazine's own ATTR.COM.

SHARE YOUR SECRETS

Reveal your latest DOS and systems discoveries through User-to-User; we'll pay you \$50 for any submissions we print. Please submit your letter on-disk together with a printout. Mail your contribution to User-to-User, PC Magazine, One Park Avenue, New York, NY 10016, or upload it to PC MagNet (see page 10 for access instructions). We regret that we're unable to acknowledge submissions or answer letters individually. ■

F.BAT

COMPLETE LISTING

```
ECHO OFF
CLS
ECHO .
ECHO A search for Drive C files with an archive attribute is under way.
ECHO .
ECHO Please WAIT. I will beep when finished.
C:
CD C:\NORTON
PATH C:\DIRMAGIC;C:\BATCH
CTTY NUL
Rem PREVENTS WRITING OF UNNECESSARY NORTON MESSAGES TO SCREEN
FA \*.* /A/S > C:\BATCH\$.ASC
FA C:\BATCH\$.ASC /A-
CTTY CON
ECHO .
ECHO The search for Drive C files with an archive attribute is complete.
BEEP
ECHO .
PAUSE
ECHO .
TYPE C:\BATCH\$.ASC
ECHO .
ECHO If you wish to see the list again, view the C:\BATCH\$.ASC file
ECHO .
PAUSE
CD C:\BATCH
DM
Rem WRITES A DIRECTORY MAP TO SCREEN AND PERMITS VIEWING OF $.ASC FILE
CPATHU
Rem BATCH FILE THAT CHANGES PATH AND WRITES "UTILITY MENU" TO SCREEN
```



Figure 1: F.BAT finds and lists the files that have been created or changed since the last backup; for a version that uses only DOS commands, see Figure 2.

YOU NEED PEN COMPUTING

(BUT YOU MAY NOT KNOW IT)

You may not even know what pen computing is or what it can do for your organization. Experts* predict that *Fortune 1000* companies collectively will be saving hundreds of millions of dollars in data-entry costs alone through pen computing by 1995, not to mention improvements in customer service, field sales, inventory reporting, medical record keeping, and claims adjusting, to name a few applications.

To better understand how to apply pen computing to the challenges facing your organization, come to the first *Pen Computer Users Conference* for prospective users. Managers who are using pen computing today in organizations like yours will discuss how they gained the acceptance of upper management and end-users, and developed software. The major pen computer systems available today will be demonstrated.

The Pen Computer Users Conference has been guided by The National Advisory Council on Pen Computing, whose members will speak at the conference.

- | | |
|---|---|
| ▶ Portia Isaacson, Ph.D., Dream Machine | ▶ Tim Bajarin, Creative Strategies Research International |
| ▶ Andrew Seybold, Dataquest | ▶ Peter Tiege, Infocorp |
| ▶ Bill Lempesis, <i>The Lempesis Report/Pen Vision News</i> | ▶ Bruce Stephen, International Data Corporation |

Other industry experts will speak including John Rizzo of Momena, Pradeep Singh of Microsoft, Chuck Ennis of TelePad, Jeff Hawkins of GRiD, David Fox of Nestor, and Harry Gierhart of OCR Systems.

A total of 16 sessions will be held on key topics including:

- | | |
|--|---|
| ▶ Gaining User Acceptance | ▶ Pen-Top Computers |
| ▶ Pen Computing's Return on Investment | ▶ Wireless Communication via Handheld Pen Systems |
| ▶ Demonstrating Advantages to Management | ▶ Palmtop Computers and Pens |
| ▶ Handwriting Recognition Applications | |

Register now or call for more information on pen computing. Be sure to ask about the conference transcript available on interactive diskette. (800) 729-3660.

PEN COMPUTER USERS CONFERENCE

January 15, Baltimore, MD.
Stouffer Harborplace Hotel

Advance registration: \$419 (\$479 after December 18)

*Pen Vision News/Lempesis Report

The Pen Computer Users Conference has been organized by the National Advisory Council on Pen Computing in conjunction with Ogilvy & Mather to advance the development and utilization of pen computing in new applications worldwide

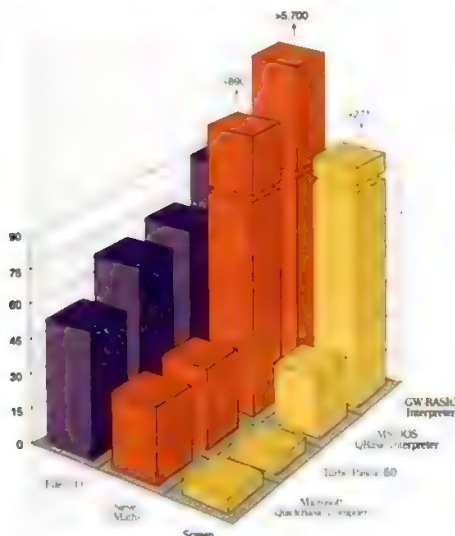


MICROSOFT
SOFTWARE
DEVELOPMENT
TOOLS

Zip. Bam. Boom.



Compiling your application is as easy as choosing **Make EXE File**. If you need help on a language keyword, it's only a keystroke away.



Benchmark comparison shows the speed of the Microsoft QuickBasic compiler.*

That's how it feels to build a DOS*.EXE with the remarkable Microsoft QuickBasic™ compiler.

To start with, you can zip right along when writing code. Because you'll be working in a fast development environment that includes debugging aids such as watch variables and conditional breakpoints. And a multiple-module, multiple-window, syntax-checking editor. Plus context-sensitive help that answers your questions with a single keystroke or mouse click.

Then, when your app is completely finished, just unleash our high-speed native 80x86 compiler. And bam. You'll have a 100% standalone executable that's very quick. Very powerful, too, since it can access all 640K of DOS memory.

The final result: a fast, sophisticated application that can be distributed without paying any runtime fees.

So call us at (800) 541-1261, Dept. T45, or see your Microsoft dealer. And find out how Microsoft QuickBasic compiler can create your own personal boom in programming.

© 1991 Microsoft Corporation. All rights reserved. Printed in the U.S.A. Customers inside the 50 United States, call (800) 541-1261, Dept. T45, outside the 50 United States, call (206) 936-8661. Customers in Canada, call (416) 568-3503. Microsoft, the Microsoft logo, MS-DOS and GW-BASIC are registered trademarks and Microsoft QuickBasic and QBasic are trademarks of Microsoft Corporation. Turbo Pascal is a registered trademark of Borland International, Inc. *As used, "DOS" refers to MS-DOS or PC DOS operating systems. †Times in seconds. Tests run on an 8 MHz IBM AT with no math coprocessor. Screen test used an EGA color system. Microsoft QuickBasic and Turbo Pascal times are for compiled programs.

PROGRAMMER'S TIPS

Key Features

- High speed native 80x86 compiler
- Max DOS capacity
- Multiple Modules
- Run/Edit/Continue w/o recompiling
- PROCEDURES & FUNCTIONS w/ local variables & parameter passing
- User Definable data types/structures
- SELECT CASE & DO/WHILE
- Line Numbers & GOTO/GOSUB
- Watch Variables

	Microsoft QuickBasic Compiler	MS-DOS QBasic™ Interpreter	GW-BASIC™ Interpreter	Turbo Pascal® 6.0
Yes	Yes	No	No	Yes
640K	640K	160K	64K	640K
Yes	Yes	No	No	Yes
Yes	Yes	Yes	No	No
Yes	Yes	Yes	No	Yes
Yes	Yes	Yes	No	Yes
Allowed	Allowed	Allowed	Required	Allowed
Yes	Yes	No	No	Yes

More powerful than QBasic Interpreter or GW-BASIC, Microsoft QuickBasic is as structured as Pascal, yet surpasses it in productivity.

- Use the exclusive QuickLib's to add new commands and functions. For instance, specialized math, file I/O, database, and graphics.
- You can use hundreds of 3rd party/shareware libraries. Or make your own QuickLib's by compiling a Microsoft QuickBasic module.

Microsoft

edited by
Trudy Neuhaus

Languages

PUTTING TYPED CONSTANTS TO WORK

Since Borland has introduced typed constants in Turbo Pascal, programmers can use them as static variables. (This is the same as variables of storage class static in C.) On page 57 of Borland's Turbo Pascal 6.0 Programmer's Guide it says:

"Typed constants can be compared to initialized variables—variables whose values are defined on entry to their block. . . . Typed constants can be used exactly like variables of the same type, and can appear on the left-hand side in an assignment statement. Note that typed constants are initialized *only once*—at the beginning of a program. Thus, for each entry to a procedure or function, the locally declared typed constants are not reinitialized."

If you define any local typed constant, it behaves as a static variable. You don't have to do anything more! Just keep it in mind, and at some point this feature is bound to come in handy. `STATIC.PAS`, which is shown in Figure 1, is a very simple program that illustrates the abilities of Turbo Pascal typed constants.

Roumen Roupski
Vanier, Ontario
Canada

 The program in Figure 1 illustrates that typed constants can act as static variables, but it doesn't really show you *why* this is a useful feature. I whipped up `STATIC2.PAS`, the program in Figure 2, to demonstrate one possible use.

`STATIC2.PAS` gives you a simple typing test: If you can finish typing the three test sentences before the program does, then you pass the test. This program repeatedly calls three procedures in a seemingly never-ending loop. Each one of the procedures has an ongoing task, and each time through the loop it performs a certain part of that task. Typed constants serve to maintain important values between procedure calls.

- **PUTTING TYPED CONSTANTS TO WORK:** Here's a Turbo Pascal program that uses typed constants as static variables and shows you just how powerful they can be.
- **AVOID ROUNDING ERRORS:** This short QuickBASIC function lets you perform currency calculations without rounding errors.

The first procedure, `TickTock`, is a timing routine that makes a tick-tock sound. It uses the timer tick count, a `LongInt` residing in low memory at `0040:006C`, to time its activity. Nine ticks

is about half a second; if the current count is greater than 9 plus the value of static variable `TickWas`, it's time to make a sound. The static variable `High` controls whether it's a high or low sound; each time we make a sound, we toggle the value of `High`. Finally we set `TickWas` to the new value of `TickCount`.

If `TickCount` was *not* greater than `TickWas` plus 9, we have to check whether it's greater than the previous value of `TickWas` alone. If so, we turn off the sound. Each time we make a tick sound, it will continue to sound until the tick count changes, so each tick is about 1/18 second long.

The next procedure that uses static variables is `TestString`, which steadily writes the typing test strings one character at a time. The technique is similar to that of `TickTock`, but the time between characters is determined by the global constant `TimeFactor`. The `X` and `Y` coordinates for the *next* character to be written are stored in static variables, and the

STATIC.PAS

COMPLETE LISTING

```
PROGRAM TestStaticVariables;
CONST Limit      = 10;

PROCEDURE Proc1;
CONST Counter : Integer = 0;
BEGIN
  Inc(Counter);
  IF Counter > Limit THEN Halt;
  WriteLn('First Counter :', Counter:5);
END; { Proc1 }

PROCEDURE Proc2;
CONST Counter : Integer = 0;
BEGIN
  Inc(Counter);
  IF Counter > Limit THEN Halt;
  WriteLn('Second Counter :', Counter:5);
END; { Proc2 }

BEGIN
  WHILE True DO
    BEGIN
      Proc1;
      Proc2;
    END;
  END. { TestStaticVariables }
```

Figure 1: This simple program demonstrates that local typed constants retain their values between invocations of a procedure.

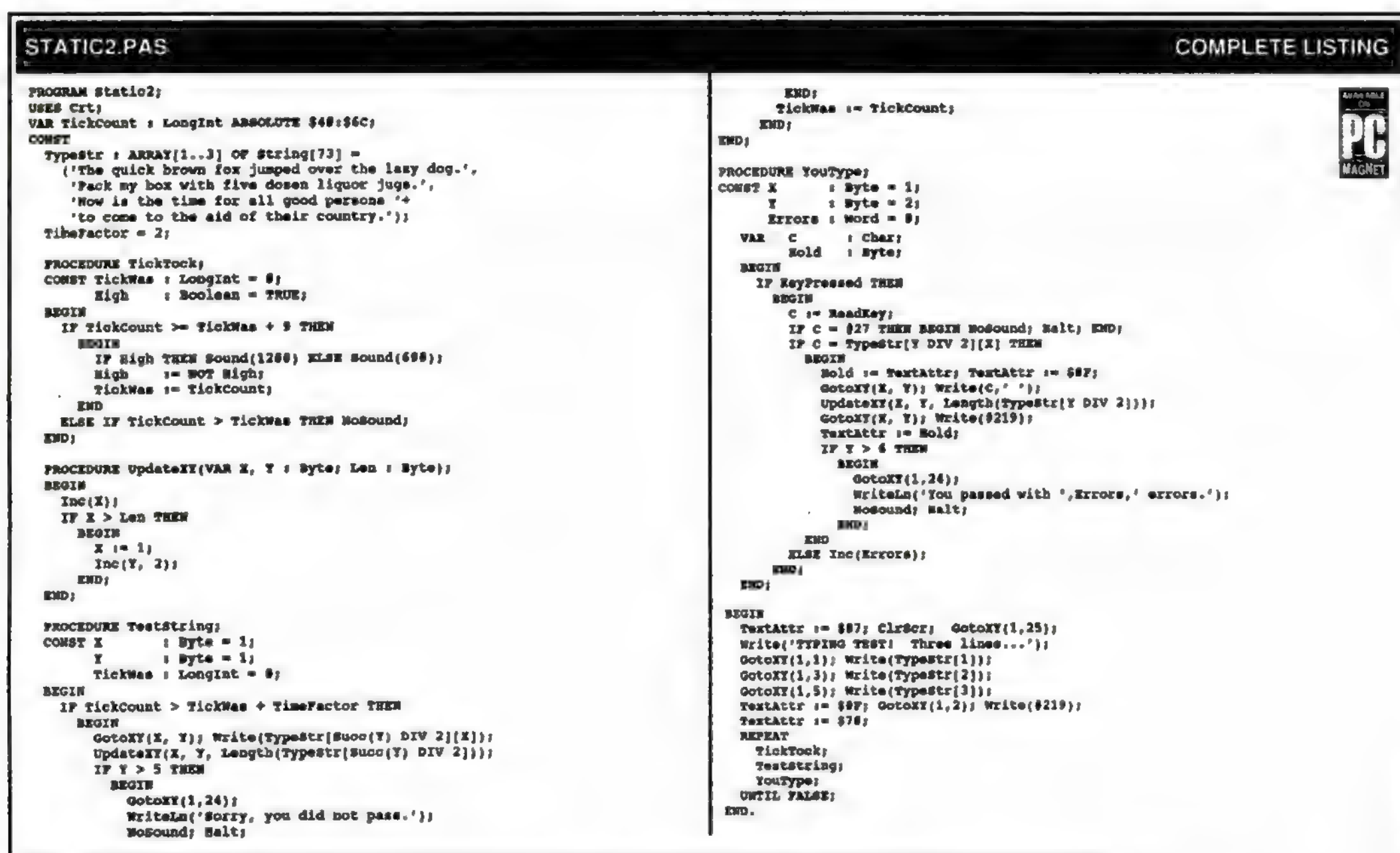


Figure 2: This program simulates multitasking procedures; each procedure stores necessary information in local typed constants.

procedure updates them after each time it writes a character. Because the main body of the program leaves the TextAttr variable set to \$70, TestString writes its characters in reverse video.

Finally, the procedure YouType takes your typing input and, if it's correct, echoes it to the screen. This procedure also has static variables to track the X and Y coordinates for the next character, and it also counts your mistakes in a local typed constant called Errors. Before writing anything, YouType saves the current TextAttr and changes the TextAttr to \$0F, which is bright white. Afterward, it restores the saved value. YouType doesn't depend on the timer; it will do *nothing* until you press a key.

Run the program and you'll see that the three procedures *seem* to be executing at the same time. The tick-tock sound ticks away at regular intervals, the test strings continually get rewritten in reverse video, and your input appears on-screen just as fast as you type it. This kind of simulated multitasking really shows off the power of static variables.

—Neil J. Rubenking

AVOID ROUNDING ERRORS

QuickBASIC's long integer data type provides a convenient facility for storing and manipulating currency values while avoiding the rounding errors that often occur using real numbers. By storing currency amounts as an exact integer number of pennies and adding only the decimal point when displayed, you can ensure that a program's arithmetic will be performed correctly.

Unfortunately, when my program took the amount \$772.68, multiplied it by 100, divided it by 100, and yielded a result of

\$772.6799999999999, I realized that this approach has its limitations!

BASIC's PRINT USING statement will hide this inconsistency in most cases, but my application required that the number be converted to a string so it could be edited on a character-by-character basis. I couldn't simply truncate the number at two places after the decimal point, since this could cause an error of 1 penny.

To solve this problem, I wrote a short QuickBASIC function (shown in Figure 3) that accepts a long integer and returns a string containing the equivalent as dollars

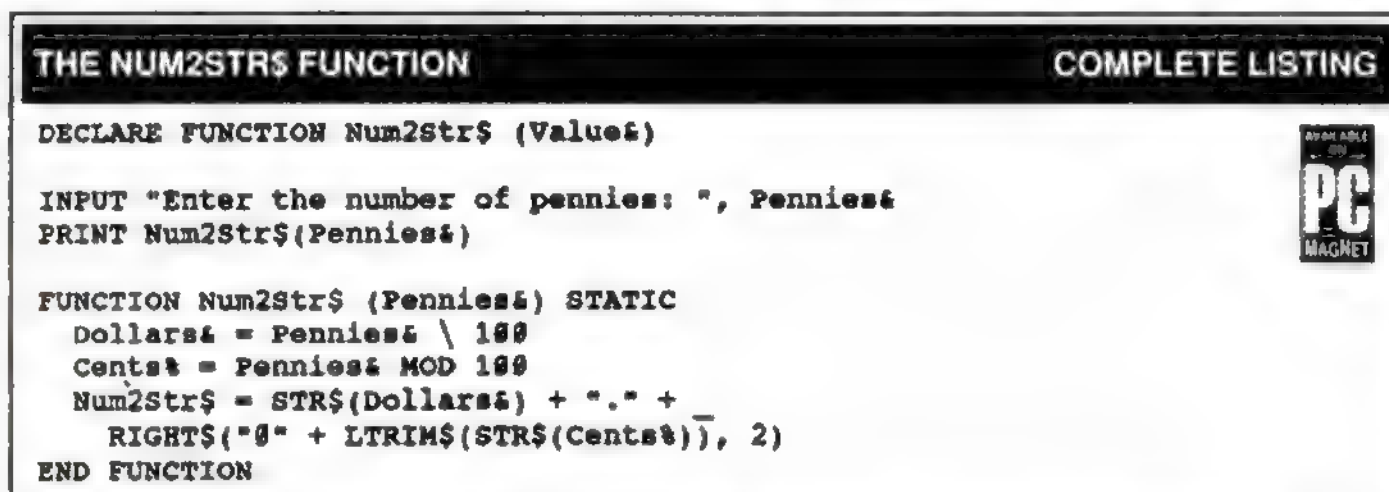


Figure 3: This QuickBASIC function accepts a long integer and returns a string containing the equivalent as dollars and cents.

Languages

and cents. Num2Str\$ never uses real-number arithmetic, so rounding errors are completely avoided.

The function also allows for minor modifications. For example, it's simple to add a dollar sign or insert commas. Or, if you prefer to have negative numbers parenthesized, just replace the line that tests for this to the following:

```
Value < 0 THEN  
N$ = "(" + N$ + ")"
```

Since long integers can accommodate dollar amounts larger than plus or minus 21 million, Num2Str\$ provides a versatile and convenient method to ensure perfect accuracy in nearly any type of financial application.

John Clyman
Pacific Palisades, California



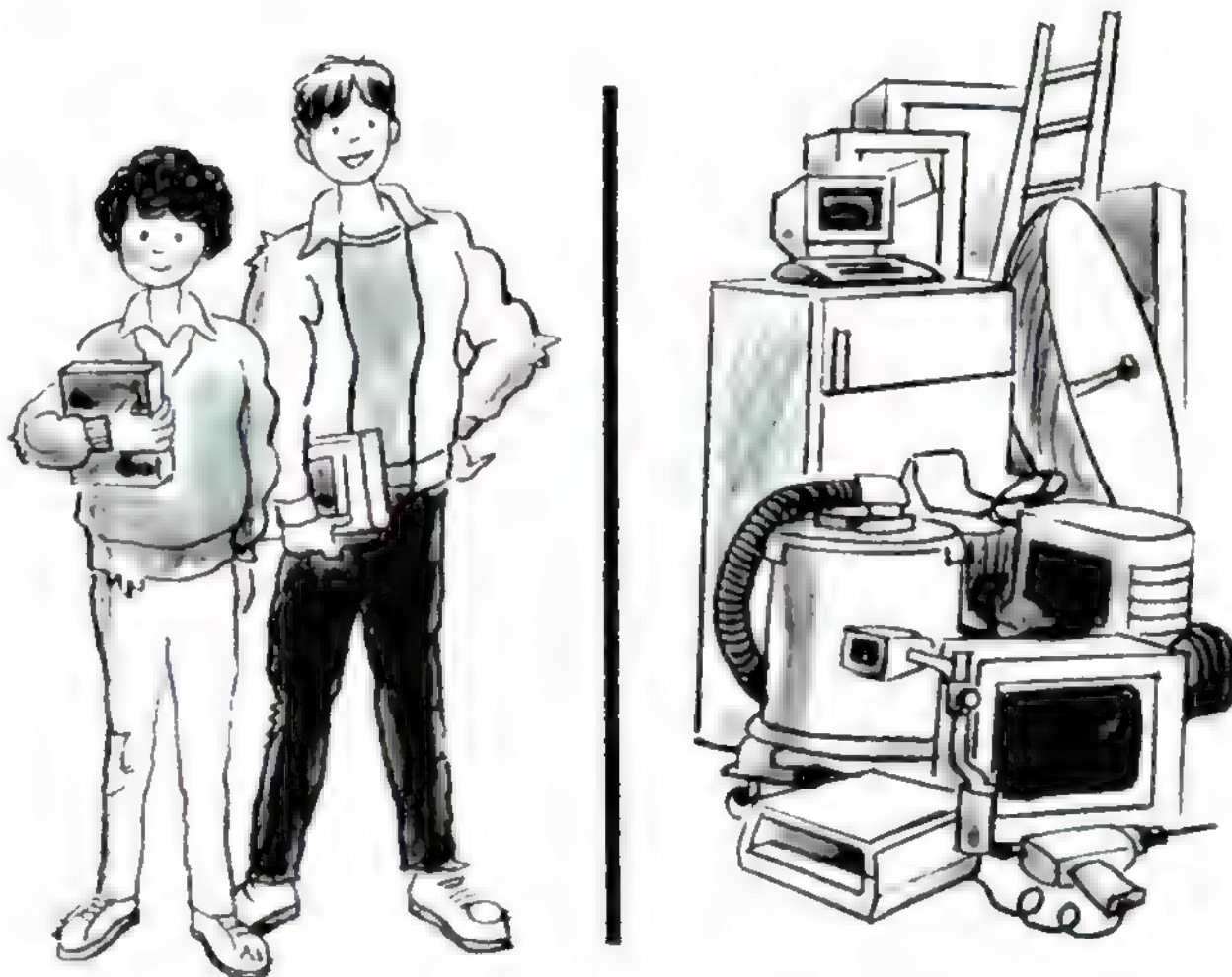
Using long integers to avoid rounding errors is a well-known and effective technique. Avoiding floating-point values is a good idea in general because integer and long integer operations are performed much more quickly. Further, if a QuickBASIC program can avoid real numbers entirely, it will be substantially smaller. All of the language routines that perform floating-point calculations are in a separate section of the QuickBASIC linking library, and are added to a program only if it actually requires them.

As submitted, Mr. Clyman's function used floating-point math, although it still solved the rounding problem. I rewrote Num2Str\$ to use only integer division and BASIC's MOD operator, which results in less code that also runs faster.
—Ethan Winer

SPEAK YOUR LANGUAGE

Share your knowledge of BASIC, C, Pascal, and assembly with Languages readers; we'll pay you \$50 for any tip we print. Please send a disk along with a printout. Mail your contribution to Languages, PC Magazine, One Park Avenue, New York, NY 10016, or upload it to PC MagNet (for access instructions see the PC MagNet News page which follows the Utilities column). We regret that we are unable to acknowledge submissions or answer letters individually. ■

What do these needy kids have in common
with excess inventory?



They are all going to college through EAL!!

CALL EAL IF YOUR CORPORATION HAS MATERIAL AVAILABLE FOR DONATION.

- EAL** - Will take your donated material and use it to generate scholarships for needy, deserving students.
- EAL** - Donations could mean an above cost tax deduction - IRS Reg.170(e)(3).
- EAL** - Scholarships are given in the donating corporation's name.
- EAL** - Leverages your gift to help participating colleges.



EAL

Educational Assistance Ltd.™

P.O. BOX 3021 • GLEN ELLYN, ILLINOIS 60138 • FAX (312) 690-0565

For More Details
Call 312-690-0010
(After Nov. 11, 1989 area code 708)
Peter Roskam
Executive Director

ANNOUNCING

COMPUTER SELECT™

The Most Complete Database Of Computer Product Information Available



Get instant access to more than...

- ✓ 70,000 articles and abstracts from over 140 leading publications
- ✓ 70,000 hardware, software and communications product specs
- ✓ 12,000 company profiles, including addresses and phone numbers
- ✓ 9,000 definitions of computer and telecommunications terms.

Tens of thousands of reviews, analyses, buyer's guides and manufacturer listings—on one disc! COMPUTER SELECT makes it easy to browse titles, read entire articles, check abstracts and find the names and addresses of manufacturers...fast. You can copy data to a file or print out all or part of your search results. Call for a **free** demonstration disk!

Now there's COMPUTER SELECT. It's the new, enhanced version of the Computer Library database, developed by the publishers of PC Magazine and PC Week. With COMPUTER SELECT you can identify, evaluate and select the computer products you need in a fraction of the time.

Find All The Hardware And Software Information You Need...From Product Evaluations And Specifications Right Down To The Manufacturer's Phone Number

COMPUTER SELECT gives you immediate access to information from the best magazines, newsletters, technical and business publications reporting on the

COMPUTER SELECT HELPS ANSWER KEY QUESTIONS FASTER, SMARTER, EASIER

1. In a given product category, such as battery-powered 20 mhz 80386-sx portable computers, what are the available products...their specifications...their prices?
2. What are all the products in a given category whose list price is less than my budget?
3. Which products earned the best reviews in a given category?
4. What does the installed user base say about my options?
5. Will it run on my LAN?
6. What tips and techniques can I learn to get more from the products I use?
7. If I buy a particular product now, is the manufacturer likely to be in business if I need help later?
8. What are the benefits of upgrading to the new version of a software product I use?
9. How do I reach a manufacturer? Is there an 800 number?
10. What are the marketing strategies of a given computer industry company...who is the key marketing contact?

computer industry. Researching products can be done quickly and efficiently right at your desk.

Then, when you find the product that's best for your needs, you can obtain its specifications and locate the manufacturer in a snap. Because now COMPUTER SELECT incorporates all the reference information from *Data Sources*® the leading computer industry directory. That means you'll find specs for over 67,000 hardware, software and data communications products—plus profiles of the 11,000 companies that make the products you want.

YOU'LL SEE RESULTS IN LESS THAN ONE HOUR

New users are doing productive work in less than one hour. No installation is needed. Just pop in the CD-ROM disc and a few simple steps locate, retrieve and print the information you want. And a new, updated disc is sent to you each month so you'll always have current product information.



FREE!

If you call now and become a COMPUTER SELECT subscriber you'll receive a BONUS DISC FREE!

This disc contains the complete COMPUTER SELECT publication file covering all of 1990 to use as the base of your computer library. Combined with the new discs you'll receive as a subscriber, you'll have a comprehensive database of both historical and current information!

COMPUTER SELECT is "Highly Recommended" for...
• Micro Managers • PC Coordinators • MIS Directors • LAN Administrators • Purchasing Agents • Information Center Managers • User Support Groups • Training Organizations • Programmers • Developers • Product Marketers and Planners • Resellers • OEMS • VARS • System Integrators • Journalists • Consultants • Industry Analysts • Salespeople • Public Relations Managers • Law Firms

CALL NOW FOR A FREE DEMONSTRATION DISK

212-503-4400

COMPUTER LIBRARY

Computer Library, Computer Select and Data Sources® are trademarks of Ziff Communications Company © 1991 Ziff Communications Company

COMPUTER SELECT helps you S-T-R-E-T-C-H your resources!

In today's economic climate many companies have put a lid on support expenditures, but not on workload or expectations. That's why COMPUTER SELECT is more essential than ever. It's designed to stretch your support resources and promote cost-effective purchasing.

"COMPUTER SELECT is the best single source of industry information available, and it's at my fingertips whenever I need it."

*Jonathan D. Lazarus/Microsoft Corporation
General Manager, Systems Software Marketing*

"The real value of COMPUTER SELECT is in the hidden cost of missed information that could be mission-critical. With this product's ability to conduct broad-based queries, you can be confident that you have checked all the relevant sources and you're thoroughly up-to-date."

*Bob Hayes/Nordstrom, Inc.
Technology Architecture Manager*

"I was looking for a tape backup device that could hold 2.2 gigabytes. A search like that used to take days. With COMPUTER SELECT it took 10 minutes to get all the information I needed."

*Joseph Curtis/Joson Edison
General Manager for Systems Engineering*

by
Jeff Prosis

Tutor

SHARE UNDER DOS 5.0

DOS 4.0 has a message that warns users to load SHARE for hard disks with large partitions. Is it also necessary in DOS 5.0 to load SHARE if your hard disk contains logical drives larger than 32MB?

James R. Sanderson
Alexandria, Virginia



No, it is not. SHARE was required in DOS 4.0 to prevent programs that used file control blocks (FCBs) when accessing files from inadvertently destroying data in large partitions. FCBs are data structures that date all the way back to Version 1.0 of DOS. They were used to track the state of open files. In DOS 5.0, that function was moved to the DOS kernel. Therefore, SHARE is no longer required in 5.0.

You may still opt to use SHARE if

- You run any sort of multitasker that makes it possible for more than one program to access the same file at the same time (for example *Windows 3.0* running in 386 Enhanced mode).
- You run DOS 5.0 in a networked environment where it is possible for a file to be accessed by more than one program simultaneously. Typically, SHARE or an equivalent utility is required for PCs configured as servers.

In these situations, SHARE can prevent the accidental data loss that results when two programs access a file at the same time and one program overwrites the changes wrought by the other. If SHARE is not installed, DOS permits unrestricted access to a file. If SHARE is installed, the first program that opens the file can deny access to the others. Normally, this isn't automatic; programs have to take specific steps to lock each other out. However, *Windows 3.0* makes it more or less automatic. Try to open the same file concurrently from two different DOS prompts with *Windows* running in 386 Enhanced mode, and you'll get a sharing violation error—even if neither program indicated that it wanted sole access rights

■ **SHARE UNDER DOS 5.0:** You don't need to load SHARE under DOS 5.0 for large partitions. The Tutor tells you when you do still need it, and why.

■ **REPLACING INTERNAL DOS COMMANDS:** Here are three ways you can supersede an internal DOS command with one of your own.

to the file before opening it.

SHARE also adds a capability to DOS known as *file locking*, which restricts access to certain regions of the file while permitting access to others. Other programs can open a file that contains a locked region, but they cannot write data to the restricted area of the file until it is unlocked by the program that locked it.

REPLACING INTERNAL DOS COMMANDS

I have written several utilities that perform the same functions as DOS commands, only better. It's easy to replace external DOS commands, but how can I replace internal DOS commands such as DEL and COPY with my own utilities?

Keith Montz
Houston, Texas



That's a good question, and one that anyone who owns a public domain or shareware utility modeled after a DOS command might be interested in. Basically, there are three ways to replace an internal DOS command with an external utility.

If you're running DOS 5.0, you can do it with a DOSKEY macro. Suppose you have a utility named PCOPY that you want to substitute for DOS's COPY com-

mand. Furthermore, suppose that PCOPY is stored in the \UTIL directory of drive C:. Enter the command

```
DOSKEY COPY=C:\UTIL\PCOPY $*
```

DOSKEY macros, unlike batch files, take precedence over internal commands. So when you type COPY, DOSKEY will intercept the command before COMMAND.COM sees it and execute PCOPY instead. It will also pass it all the parameters that you entered on the command line by virtue of the \$* parameter. If there's a PATH to C:\UTIL, it's not strictly necessary to specify the drive and directory where PCOPY is stored. However, doing so permits the command to execute more quickly, since DOS won't have to search all the directories specified in the PATH environment variable.

You can use this DOSKEY feature in other important ways, too. You can even redefine an internal DOS command with a variation of itself. For example, the command

```
DOSKEY DEL=DEL $* /P
```

modifies DEL to prompt you with the name of each file before it is deleted, which should all but eliminate DEL *.* errors. If you want to use the unmodified DEL command, you can do so by typing a space before DEL when you're on the command line so that DOSKEY will ignore the macro named DEL. Alternatively, you could use the ERASE command, which is unaffected by the macro.

The second way to replace an internal command works in any version of DOS. It involves using DEBUG to search COMMAND.COM's table of internal command names and patching COMMAND.COM so that the specified command is no longer recognized. In Microsoft's DOS 5.0, the commands

```
DEBUG COMMAND.COM
```

```
E A93B "copy"
```


Tutor

effectively erase the COPY command by overwriting it with lowercase characters, which COMMAND.COM does not recognize when it's searching for command names (note that the address A93B is subject to change in future versions, and may even differ in other manufacturers' releases of DOS 5.0). If you then rename PCOPY.COM to COPY.COM and reboot so that the modified version of COMMAND.COM is loaded, DOS will execute PCOPY rather than its own internal COPY command when you type COPY on the command line.

The location and format of the command table vary, depending upon the brand and version of DOS you're using. You can locate the proper patch point for any command in any version of DOS by using DEBUG's S (for Search) command. First, go to the directory where COMMAND.COM is stored and start DEBUG by typing

```
DEBUG COMMAND.COM
```

Then type

```
R CX
```

to determine the length of COMMAND.COM. Call the number that's displayed in response to this command (after the CX in the left margin) xxxx. Then, if you're looking for the COPY command, type

```
S 0100 xxxx "COPY"
```

substituting the value you obtained earlier for xxxx. DEBUG will respond with one or more addresses in segment:offset form. In Version 5.0, DEBUG will answer 0C56:89BA and 0C56:A93B (the segment portion of the addresses—the

0C56—may be different on your PC). Your next challenge is to determine which of these addresses lies within the table of internal command names. To do so, use DEBUG's D (for Dump) command to examine the contents of memory in and around these addresses. If you type D 89BA in DOS 5.0, you'll see the portion of COMMAND.COM where help messages are stored. Specifically, you'll see the help text displayed when you type COPY /?. Since this isn't the area of COMMAND.COM you want to patch, type D A93B, and you'll see the hex dump that appears in Figure 1, which reveals part of COMMAND.COM's table of internal command names.

To disable the COPY command, replace "COPY" in the command name table with a fictitious name that contains the same number of characters. Actually, this doesn't disable the COPY command; it simply changes its name to something else. For example, if you overwrite "COPY" with "ZZZZ" you can still execute the COPY command by typing ZZZZ. What's more important is that COMMAND.COM will no longer treat COPY as an internal command. When you type COPY, COMMAND.COM will search its table of internal command names and, when it fails to find a match, try to execute it as an external command by looking for a file of the same name with a .COM, .EXE, or .BAT extension in the current directory and in the PATH.

Before you patch COMMAND.COM, make a backup copy of it and store the backup in a safe place. Then, if something goes wrong, you can restore the system to its original state by overwriting the altered COMMAND.COM with the backup. It's also not a bad idea to have a system-formatted disk lying around, just in case you need to boot from one.

The third and final method for replacing an internal DOS command with an external utility is the cleanest of all, but it's also the most complicated. It requires

that you make some changes to the utility itself, so it's only viable if you're the one who wrote the utility or if you have access to the source code. It also requires DOS 3.3 or later.

The key is a pair of undocumented functions accessed through interrupt 2Fh (the *Multiplex* interrupt). In Version 3.3 and later, before DOS executes a command entered on the command line, it calls interrupt 2Fh with AX set to AE00h, DS:BX pointing to a copy of the command line (including a pair of count bytes at the beginning), and DS:SI pointing to a copy of the command entered on the command line (without trailing parameters, in uppercase, and with spaces removed) preceded by a byte that denotes the length of the command. If the interrupt 2Fh handler returns 0 in AL, then DOS executes the command as usual. But if it returns AL set to FFh, then DOS calls interrupt 2Fh again, this time with AX equal to AE01h and DS:SI again pointing to the command entered on the command line preceded by a length byte. If the interrupt 2Fh handler sets the length byte to 0 on return, then DOS doesn't execute the command; instead, it assumes that the program that intercepted the call to interrupt 2Fh executed the command itself.

The upshot of all this is that you can write a TSR that adds internal commands to DOS. And since DOS places these calls to the Multiplex interrupt before it executes any command, even internal commands, you can write commands that replace internal DOS commands. The program in Figure 2 shows how. NEWCMD installs a replacement for the CLS command that clears the screen to white on blue when you type CLS at the DOS prompt. Actually, it's not a total replacement for CLS; it works only in text mode, and it works only on color systems. But it demonstrates how you can add internal commands to DOS by tapping into interrupt 2Fh and trapping functions AE00h and AE01h.

When it's started, NEWCMD verifies that it's running DOS 3.3 or later. Then it saves the current interrupt 2Fh vector, replaces that vector with the address of its own interrupt 2Fh handler (the procedure MPLEX_INT), and calls DOS function 31h to become memory resident. Once installed, it monitors interrupt 2Fh and traps interrupts that occur with AX equal to AE00h or AE01h. If function AE00h is called and the buffer at DS:SI contains a count byte of 3 followed by the letters

DOS 5.0'S TABLE OF INTERNAL COMMAND NAMES									
0C56:A93B							43	4F	58 59 83
0C56:A940	C3	38	B4	84	85	58	41	55-53	45 86 4A 1A 3E 85 84
0C56:A950	44	41	54	45	82	C4	2F	C4-84	84 54 49 4D 45 82 2D
0C56:A960	38	1E	85	83	56	45	52	82-B7	1D 28 85 83 56 4F 4C
0C56:A970	83	BB	1C	38	85	82	43	44-83	77 25 A8 84 85 43 48
0C56:A980	44	49	52	83	77	25	A8	84-82	4D 44 83 E2 25 EA 84
0C56:A990	85	4D	4B	44	49	52	83	E2-25	EA 84 82 52 44 83 56
0C56:A9A0	26	8A	85	85	52	4D	44	49-52	83 56 26 8A 85 85 42
0C56:A9B0	52	45	41	4B	82	BC	37	9E-84	86 56

Figure 1: Part of COMMAND.COM's table of internal commands.

NEWCMD.ASM
COMPLETE LISTING

```

;*****
; NEWCMD illustrates how interrupt 2fh, functions AE00h and AE01h can be
; used to add new internal commands to DOS. NEWCMD installs a replacement
; for the CLS command that clears the screen to white on blue when CLS is
; typed on the command line. Requires DOS 3.3 or higher.
;*****

color equ 1fh ;Colors to clear the screen
; to (default=white on blue)

code segment
assume cs:code
org 100h
begin: jmp init

command db 3,"CLS" ;Command text
int2fh dd ? ;Interrupt 2fh vector

;*****
; MPLEX_INT handles calls to interrupt 2fh.
;*****

mplex_int proc far
pushf ;Save FLAGS
sti ;Interrupts on
cmp ax,0AE00h ;Branch if this is
je check_cmd ; function AE00h
cmp ax,0AE01h ;Also branch if it's
je exec_cmd ; function AE01h
;Restore FLAGS and chain
; the interrupt
mplex_exit: popf
jmp cs:[int2fh]

check_cmd: call compare ;Inspect the command string
jne mplex_exit ;Exit if it's not CLS
mov al,0FFh ;Set AL to FFh and exit
popf ; If it is
iret

exec_cmd: call compare ;Inspect the command string
jne mplex_exit ;Exit if it's not CLS
mov byte ptr [si],00h ;Nullify the string
call cls ;Clear the command from the
popf ; buffer and exit
iret

mplex_int endp

;*****
; COMPARE returns with the S flag set if the command pointed to by DS:SI
; is "CLS," or with S clear if it's not.
;*****

compare proc near
push ax ;Save registers
push si
push di
push es
;Point ES:DI to command
; text in this segment
mov di,offset command
;Clear direction flag
mov cx,4 ;Compare up to four bytes
repe cmpsb ;Compare while equal
pop es ;Restore registers and exit
pop di
pop si
pop ax
ret
compare endp

;*****
; CLS clears the screen.
;*****

```

```

cls proc near
push ax ;Save registers
push bx
push cx
push dx
push ds

mov ah,12h ;See if an EGA or VGA is
mov bl,10h ; installed
int 10h
mov ax,40h ;Point DS to the BIOS data
mov ds,ax ; area
mov ax,0600h ;Prepare for call to
mov bh,color ; function 06h in the
xor cx,cx ; video BIOS
mov dh,24
mov bl,10h ;Branch if this is a CGA
je getcols ; or MDA
;Get line count from BIOS
mov dx,ds:[84h] ;Get column count, too
dec dx ;Decrement it
;Clear the screen
mov ah,02h ;Move the cursor by calling
mov bh,ds:[62h] ; function 02h in the video
xor dx,dx ; BIOS
int 10h

pop ds ;Restore registers and exit
pop ax
pop bx
pop cx
pop dx
ret
cls endp

;*****
; INIT makes the program resident in memory.
;*****

errmsg db "Requires DOS 3.3 or higher",13,10,"$"

init proc near
assume cs:code,ds:code
mov ax,30h ;Get DOS version number
int 21h ; with function 30h
xchg ax,al ;Swap AH and AL
cmp ax,0310h ;Branch if this is version
jge install ; 3.10 or higher

mov ah,9 ;Display error message
mov dx,offset errmsg
int 21h
mov ax,4C01h ;Exit with ERRORLEVEL=1
int 21h

install: mov ax,352Fh ;Get current interrupt 2fh
int 21h ; vector and save it
mov word ptr int2fh,bx
mov word ptr int2fh(2),ax
mov ax,352Fh ;Point interrupt 2fh to
mov dx,offset mplex_int ; MPLEX_INT routine
int 21h

mov ax,3100h
mov dx,(offset errmsg - offset code + 15) shr 4
int 21h

init endp

code ends
begin

```

Figure 2: NEWCMD installs a replacement for CLS that clears the screen to white on blue when you type CLS at the DOS prompt.

CLS, MPLEX_INT sets AL to FFh before returning from interrupt. Then, when function AE01h is called with DS:SI pointing to the same buffer, NEWCMD calls the procedure CLS to clear the screen, in effect executing its own CLS command rather than having DOS do it. Before returning, it also sets the count byte at DS:SI to 0 so that DOS won't execute the command itself. (If the count byte is not 0 on return, DOS will execute the command anyway—even if NEWCMD has already executed it.) Then it returns from the interrupt, waiting for the next occurrence of interrupt 2Fh.

Using this piece of code as a starting

point, you could write a TSR that adds not one, but several commands to DOS's repertoire. It's also relatively simple to write a TSR that disables one or more DOS commands altogether by intercepting them and simply doing nothing when they're called. You could modify NEWCMD to disable CLS, for example, by commenting out the line

```
call cls
```

in the procedure MPLEX_INT.

This method is safer and inherently more reliable than disabling internal commands by patching COMMAND

.COM, because it doesn't require users who aren't familiar with DEBUG to make changes to DOS itself.

ASK THE TUTOR

The Tutor solves practical problems and explains techniques for using your hardware and software more productively. Questions about DOS and systems in general are answered here. Send your question to Tutor, *PC Magazine*, One Park Avenue, New York, NY 10016, or upload it to PC MagNet (see page 10 for access instructions). We regret that we cannot acknowledge submissions or answer questions individually.

Tests prove UDS modems best against bad lines

Laboratory modem tests that simulate real-world distortion, frequency offset, jitter, noise, etc. consistently prove the ability of UDS modems to overcome bad telephone lines and stand out from the competition.

In recent trials by *Data Communications*, *InfoWorld* and *Byte*, our FasTalk V.32/42b emerged as a clear leader when line impairments approximating actual dial-up conditions were introduced.

All modems are not alike. FasTalk offers quality and features:

- ☐ Throughput rates up to 38.4 Kbps
- ☐ Compatible with other V.32 and V.22 bis modems
- ☐ V42 bis and V.42 for high speed, error-free data
- ☐ Sync or async capability
- ☐ Dial-up or leased line operation
- ☐ Speaker for audible call progress
- ☐ Compatible with hundreds of communications software packages.



BYTE

At a suggested list price of \$795, the FasTalk V.32/42b clearly validates UDS' price/performance leadership in V.32 technology.

Experience the quality difference, phone 205-430-8000, FAX 205-430-8208 or **800-451-2369**

CIRCLE 367 ON READER SERVICE CARD



by
Frank J. Derfler, Jr.

Connectivity

BACKING UP ON A LAN

We've used a QIC-120-based tape backup system on our *NetWare* LAN for several years. The tape mechanism and software reside on a workstation and pull the files across the network from the server after work hours. The system works fine, but it always seemed illogical to pull the files across the network. I recently saw an ad for a tape system that resides on the *NetWare* server. Can you tell me some of the pros and cons of putting the backup system in the server versus keeping it on a client PC?

George Russell
Tallahassee, Florida

PC First of all, server-based systems are faster. You may have enough after-hours time to do backups, but many organizations don't. Today, about 25 percent of the servers in PC networks have more than 500MB of storage on-line and another 20 percent have between 300MB and 500MB. If you're going to back up an entire 500MB storage system, you'll need a couple of hours at the 4-megabit-per-minute average speed of many tape products. Many organizations don't want that much data moving across the network for that prolonged period of time, so they put the storage device on the file server to improve throughput as much as possible and to reduce the network traffic caused by the backup activity.

When you have a backup device of any kind on the server, people working at networked PCs can initiate their own backups. Additionally, since you typically protect the server with backup power, good ventilation, and good physical security, the important tape system also benefits from that extra care.

On the downside, servers don't run that backup software for free. The storage management software can take a good chunk of the server's CPU activity away from the file server software. As we load an increasing number of VAPs and NLMs

- **BACKING UP ON A LAN:** Where should you put your tape backup system on a network?
- **USING A REMOTE PRINTER:** This clever trick lets a single-user program print to a networked printer.
- **BETTER GRAPHICS PRINTING:** This hardware solution speeds printing of large graphics files.
- **MAINTAINING FILE-LEVEL SECURITY:** To keep files really safe, you may need to update Novell's file-level security before and after they're edited.
- **HARDWARE HANDSHAKING:** Modems and communications software need to synchronize the flow of data.

(*NetWare* Loadable Modules) in *NetWare* servers, the once underutilized server CPU can become a bottleneck.

As another consideration, some part of the server other than the disk drives, such as the power supply or motherboard, could malfunction. Swapping out a power supply or motherboard on the server is easy for a professional maintenance person, but until the job is done you have no file server and no backup system.

Another alternative comes in the form of a dedicated tape server for network backup. If you have a tape server, anyone can initiate a backup, you can secure the

server, and you get good performance, but you don't have all of your resources riding on one motherboard and power supply. However, the tape server does put traffic on the network and it requires the full-time use of another PC.

When you decide between using a client PC, using a system integrated into the file server, or using a tape server as a LAN backup device, you have to consider factors such as the size of the file storage system, the time available for backup, the network activity, and cost. All of these alternatives will work, and growing organizations might make use of them all at different times.

USING A REMOTE PRINTER

I recently installed a small *LANtastic*/Z network to allow two PCs to share printers and files. Each PC has two serial ports and a printer attached to a parallel port. But when I ran *Quicken* on one PC, and tried to print reports from the other PC's printer, the program wouldn't cooperate. *Quicken* apparently does a physical check of the assigned printer port because it told me "Port LPT2 does not exist." The technical support people at Intuit told me that *Quicken* will not print to a networked printer; they said that the printer must be physically attached to the PC that is running *Quicken*.

After some experimenting, I came up with a solution. First I configured *Quicken*'s alternate report writer to use COM2. Since COM2 exists but isn't used on the first PC, *Quicken* was happy to send its data to COM2. Then, since *LANtastic* lets you redirect the serial port on one PC to an LPT port on another, I told the network to redirect the COM2 data to the printer on the remote node. The *LANtastic* software intercepted the data from the first computer and routed it to the printer attached to LPT1 on the second machine. Now my *Quicken* reports print out exactly as I want them to.

Tom Lund
Honolulu, Hawaii

Connectivity



This is an elegantly simple solution. With care, you can often use similar tricks to extend your hardware and software's capabilities beyond their single-user design. One way might be to create a fake physical device. Networks have the capability to create logical devices that simulate physical devices, and your equipment will never know the difference. Every once in a while you have to fool programs to get them to work properly for you.

BETTER GRAPHICS PRINTING

We create a lot of images in *Harvard Graphics* and print them on an HP LaserJet III Si across a *NetWare* LAN. However, the spooled graphics print jobs take considerably longer to move to the printer than they do when we experiment with a direct attachment to the printer. Obviously, it's not the printer that's the bottleneck. Any ideas on what can we do to speed throughput?

Gerald Diamond
Salt Lake City, Utah



I suspect there are other file access or communications actions at work on the PC acting as the print server. You could try setting up a separate PC as a remote print server, but to really speed the throughput of print jobs, consider *LansPrint*, a hardware and software package marketed by Digital Products. *LansPrint* consists of a separate I/O board designed to efficiently handle the task of talking to the printer over a parallel interface without slowing or being slowed by other processing tasks. The circuitry on the board also allows you to locate the printer as far away as 100 feet instead of the maximum of 15 to 20 feet you're typically limited to. In the PC Magazine LAN Labs we've seen printing times for large graphics jobs cut in half because of *LansPrint*'s better data handling. *LansPrint* retails for \$495 in the single port version and \$695 in the version able to handle two parallel ports. Contact Digital Products at 617-924-1680.

MAINTAINING FILE-LEVEL SECURITY

I wrote a utility to change Novell's (*NetWare 386*) bindery to reflect the file-level security access I had established within a

document management system. Each time a user in the document management system retrieved a document, the utility would be called first, and then the end-application (usually *WordPerfect*) would be called with the document loaded for editing.

The utility would examine the security assigned to this document within the document management system and then give the same list of users the same security access at the network level, thus ensuring that the network security was always in agreement with what was established within the document management system.

However, it turned out that when using *WordPerfect*, any network security set by the utility would cease to exist when the user finished editing the document. After further testing I noticed this happened only if the user saved the file before exiting from *WordPerfect*.

It became apparent that *WordPerfect* hasn't kept up with Novell's new file-level security. When you save a file in *WordPerfect*, *WordPerfect* deletes or renames the original and saves the current version as a new file. All Novell file-level access rights are deleted or moved along with the original file.

This problem isn't limited to *WordPerfect*. Any application that deletes or renames the original file before saving the new file will cause the same loss of file-level security.

The solution? Update Novell's file-level security *after* editing the file, not before. Or update before and after for greater security.

Bruce Cragun
Orem, Utah



Since many programs rename the original file before saving the new file, this would seem to be a big potential problem for anyone who wants to make heavy use of *NetWare*'s file-level security.

HARDWARE HANDSHAKING

Recently, I upgraded from a 2,400-bit-per-second modem to a MultiTech Multi-Modem696E. I've set the port speed to 19.2 kilobits to take advantage of the throughput of the modem, and my communications software detects errors and retransmits packets when I send files with Zmodem and other protocols. However, the modem manufacturer told me that I need to configure my software and mo-

dem to use *flow control*. What exactly is flow control, and why do I need it now when I never did before?

Bill Stone
San Francisco, California



There's a fundamental difference between your old modem and the new one. Your old 2,400-bps modem really could pass data at 2,400 bps, but your new 19,200-bps modem can't necessarily pass data at 19,200 bps. Yes, you can connect your PC to your new modem at 19,200 bps, but the speed at which the modem can pass data through your phone line is somewhat less. Depending on the modem model and the degree to which it can compress the data, its actual speed may vary from just below 19,200 to as little as 2,400 (through a noisy phone line). This means that if your PC sends data continuously at 19,200 bps, your modem will eventually be unable to keep up, and will lose characters. To prevent this, your modem and software must be configured to use flow control.

The flow control used most often with such modems is known as hardware handshaking or RTS/CTS—which stands for *request to send* and *clear to send*. Essentially, your modem uses one wire in the RS-232 cable to tell the software when it's ready to accept data, and your software uses another wire to control the flow of data in the opposite direction.

To activate flow control, you need to issue certain commands to your modem (the commands vary from vendor to vendor) and configure your software to use RTS/CTS (the procedure also varies from package to package). Or you can get a communications package that has built-in support for your new modem, which will take care of all of this for you. *HyperACCESS/5*, for example, supports more than 70 modems that operate with a port speed of 19,200 bps or above—including your MultiTech.

NETWORK YOUR QUESTIONS

Connectivity gives you practical solutions to networking problems of all types. We'll pay \$50 for any tip we print. Please submit your letter on-disk along with a printout. Then mail your contribution to Connectivity, *PC Magazine*, One Park Avenue, New York, NY 10016. You may also contact Frank J. Derfler, Jr. via MCI Mail (MCI ID: 240-2931) or the LAN Labs fax machine (904-837-0737). ■

Programmer's Paradise

800-445-7899

The POWER USER'S Best Software Source!

DEVELOPMENT TOOLS

386 Development

Lahey F77L-EM 32 1089
PharLap 386 DOS Extender 435
WATCOM C 8.5/386 CALL
Zortech C++ Devel. Ed. 386 845

C++ Tools

3-in-1 for C++ 179
Borland C++ 299
BrieforC++ 39
C++/Views 419
Greenleaf Fin. Mathlib ++ 155
M++ 275
Rogue Wave Math.h++ 174
Tier1 305
Zortech C++ Devel. Edit. CALL

Database Tools

.RTLink Plus 419
Blinker 175
Clarion Personal Devel. 52
Clarion Prof. Devel. 475
Clear 169
Clipper 529
dBASE IV 489
dGE 249
Paradox 3.5 525
PLink86+ 335
R&R Code Generator 129
R&R Report Writer 155
SilverComm Library 209

CORPORATE ACCOUNTS

CALL CORSOFT

1-800-422-6507

Editors

Brief CALL
MKS VI 125
Multi-Edit Professional 159
Sage Professional Editor 249

Windows Development

Actor 199
Actor Professional 399
Asymetrix ToolBook 299
Borland C++ 299
& Application Frameworks 469
CASE-W 435
CASE-W Corporate 829
Drover's Toolbox 239
KnowledgePro 399
Microsoft C 299
Microsoft Windows SDK 315
w/ MS C (Bundle) CALL
MS Quick C/Win 125
MS Visual Basic 129
Smalltalk/V Windows 399
Spinnaker PLUS 349
Turbo Pascal for Windows 165
WindowsMAKER Prof. 795

CALL FAXcenter™
(908) 389-8173

APPLICATIONS

Communications

BLAST II
Carbon Copy Plus
Crosstalk XVI
Mirror III
PC Anywhere IV

Graphics

Freelance Graphics 4.0
Harvard Graphics 3.0
HiJaak

Science/Engineering

AutoCAD
AutoSketch
Brainmaker
Chi Writer Deluxe
Derive
Design CAD 3D
Grapher
MathCAD
Mathematica
PC MATLAB
PC TEX
Statgraphics
Surfer
Systat
T3
TECH*GRAPH*PAD

Spreadsheets

Lotus 1-2-3 3.1
Lotus 1-2-3 2.3
Quattro Pro 3.0
Sideways

OVER 5000 TITLES
MAC PRODUCTS, TOO!

Utilities

386 MAX
Amidiag
Automenu
BlueMAX
Check It
Dr. Switch-ASE
Dan Bricklin's Demo II
FASTBACK Plus 3.0
Headroom
Lotus Magellan
Norton Antivirus
Norton Commander
Norton Utilities 6.0
PC Tools Deluxe 7.0
Spinrite II
VirusCure Plus
XTree Gold 2.0

Word Processing

Grammatik IV
MS Word 5.5
Professional Write
WordPerfect 5.1
WordStar Professional 6.0

WINDOWS SOFTWARE

Communications

Crosstalk for Windows 125
Dynacomm Asynch for Win. 189
Faxit for Windows 129
WIN Connect 82
WinFax Pro 79

Database & Forms

dBASE/Windows 269
FormBase CALL
Object Vision for Windows 95
SQL Windows 1199
Superbase 4 Windows 425

Environment

DR DOS 6.0 65
MS-DOS 5.0 64
Windows 3.0 95
w/ MS Mouse (Bus) 159

WE'RE THE WORLD'S BEST
SOURCE FOR WINDOWS
SOFTWARE!!
CALL TODAY!

Graphics/Publishing

Adobe Illustrator/Windows 299
Adobe Streamline/Windows 269
Arts & Letters
Graphics Composer 245
Graphics Editor 419
Corel Draw 2.0 389
Dr. Halo IV Compet 299
Harvard Draw/Windows 299
Micrografix Chansma 345
Micrografix Designer 485
MS PowerPoint 309
OmniPage Professional 655
PageMaker 499
PC Paintbrush/Windows 53
Picture Publisher Plus 479
Ventura Publisher 585

Spreadsheets

Lotus 1-2-3/W CALL
MS Excel 309
Wingz 339

Word Processing

Ami Pro 305
Grammatik Windows 52
JustWrite CALL
Legacy CALL
WinText CALL
WindowSpell 56
Word for Windows 2.0

Utilities

BeckerTools 2.0 80
Distinct Back-Up 93
Menu Direct Gold 29
MORE Windows 66
Norton Desktop 94
SitBack for Windows 99
WinSieuth 75

Dr. Halo IV

New Product!!

From Media Cybernetics, this high powered image processing utilities package is cleverly disguised as a low cost paint package. Everything you need to create, capture, manipulate, convert and print images all in one valuable package. Paint with special effects, edit large images, view and convert popular file formats, customize fonts, capture screens, and create slide shows. Super VGA support. **INTRODUCTORY/COMPETITIVE UPGRADE SPECIAL PRICE \$49**

FAXcenter # 1045-0008



BORLAND

"One, Two, Free!"

Buy Borland's Quattro Pro or Paradox 3.5 and Borland will send you TWO of the following absolutely FREE: Borland's Sidekick 2.0, Quarterdeck's QEMM-386 v6.0H, Central Point Software's Central Point Backup 7.1*



*Special offer limited by Borland

MS Word for Windows 2.0 New Version!

Microsoft Word for Windows version 2.0 makes it easier than ever for you to do everyday task such as creating tables, bullets, charts, columns, and drawings. They're all just a click away with the Toolbar. You can create envelopes or check your spelling with a mouse click, too. Microsoft Word for Windows—everyday made easy!

FAXcenter # 1269-0004

\$399



Product names and company names are registered trademarks of their respective companies.



A Division of Voyager Software Corp
1163 Shrewsbury Ave., Shrewsbury, NJ 07702

1-800-445-7899

Corporate: 800-422-6507
(CORSOFT Division)

International: 908-389-9228

Customer Service: 908-389-9229

Canada: 800-445-7899

Fax: 908-389-9227

FAXcenter: 908-389-8173™

POLICIES

Phone Orders

Mon-Fri 8:30 AM-7 PM EST, Sat 9:30-2:30 EST. We accept MC, Visa, AMEX. Domestic shipments, please add \$5 per item for shipping/handling by UPS ground. For domestic COD shipments, please add \$3. Rush service available.

Mail or FAX POs

Phone number required with order.

FAXcenter # (908) 389-8173™

Call from your FAX telephone, and follow the instructions to receive more information on the products featured above!

Corporate Accounts

Call CORSOFT, our corporate sales division. Ask about volume purchase agreements.

Returns

Subject to \$25 processing charge.

* All prices subject to change without notice.

FastData Power PCs



\$2399 FastData 486/33

If you need the ultimate in 486 power, the FastData 486/33 delivers. A true Intel™ 486-33 processor with integrated coprocessor and 8K internal cache is complemented by a 128K external static RAM cache with burst mode support to deliver 14.7 MIPS of processing power. The system is expandable to 16 megabytes of memory on-board using 1mb SIMMS, thus protecting your investment in existing memory when you're ready to upgrade. The FastMicro team has bundled the 486/33 with four megabytes of memory, a high-speed 200mb IDE hard disk and a 1mb Super VGA adaptor and Non-Interlaced monitor at an attractive price. From networking to publishing to CAD, we have what it takes to make your computer a complete solution.

Standard Features

- ✓ 33mhz Intel 80486 processor with coprocessor.
- ✓ 8K processor & 128K external static RAM cache.
- ✓ 4 megabytes of fast RAM.
- ✓ 105 mb 18ms IDE hard disk, 1:1 interleave.
- ✓ 1.2mb 5.25" and 1.44mb 3.5" floppy drives.
- ✓ Full size or upright (shown) chassis with keylock, speed and reset buttons.
- ✓ 14" SVGA Non-Interlaced color monitor, 1024x768 resolution, with 1mb VGA card.
- ✓ Clock calendar, parallel port, two serial ports, and a game port.
- ✓ Key Tronic 101 key keyboard.
- ✓ 230 watt power supply
- ✓ 8 ISA slots, 5 drive bays.
- ✓ Windows & Mouse add \$69.
- ✓ MS-DOS 5.0.
- ✓ FCC Class A approved for business use only.

486/33	80mb	100mb	200mb	340mb
Mono	\$1,979	\$2,049	\$2,299	\$2,699
Mono VGA	\$2,079	\$2,149	\$2,399	\$2,799
VGA 1024i	\$2,279	\$2,349	\$2,599	\$2,999
VGA 1024ni	\$2,329	\$2,399	\$2,649	\$3,049



FastData 386/33 \$1799

The fastest 386 processor available combined with a 64K thirty nanosecond memory cache make the FastData 386/33 a power users dream! Included in the base price is a 80 megabyte 20 millisecond hard disk, 1024 by 768 Non-Interlaced Super VGA monitor and card, four megabytes of memory, and 5.25" & 3.5" high capacity floppy drives. Plus, should anything ever go wrong with your FastData computer, you are covered by a one-year warranty with free on-site service or system replacement if we cannot correct the problem with our FastSHIP advance parts replacement program.

Standard Features

- ✓ 33mhz Intel 386-DX processor.
- ✓ 64K high-speed memory cache.
- ✓ 4 megabytes high speed RAM.
- ✓ 105 mb 17ms IDE hard disk, 1:1 interleave.
- ✓ 1.2mb 5.25" and 1.44mb 3.5" floppy drives.
- ✓ Standard chassis (shown) or mini-tower with speed, keylock and reset buttons.
- ✓ 387-DX coprocessor socket.
- ✓ 200 watt power supply.
- ✓ 14" SVGA Non-Interlaced color monitor, 1024x768 resolution, with 1mb VGA card.
- ✓ Clock calendar, parallel port, game port and two serial ports.
- ✓ Key Tronic 101 key keyboard.
- ✓ 8 slots & 5 drive bays.
- ✓ Built-in memory management.
- ✓ MS-DOS 5.0.
- ✓ Windows & Logitech Mouse add \$69.
- ✓ FCC Class B approved.

386/DX33	80mb	100mb	200mb	340mb
Mono	\$1,379	\$1,449	\$1,699	\$2,099
Mono VGA	\$1,479	\$1,549	\$1,799	\$2,199
VGA 1024i	\$1,679	\$1,749	\$1,999	\$2,399
VGA 1024ni	\$1,729	\$1,799	\$2,049	\$2,449

All FastData Systems Include:

- Toll-Free Technical Assistance for Life
- 'FastSHIP' Advance Parts Replacement
- On-Site Service or System Replacement Should Unusual Problems Arise
- 30 Day Money Back Guarantee
- FastMicro Peace of Mind

FastData NoteBook

New 80mb SX/20 model!
Call for pricing & specifications.



FastData SX Systems



\$1399 *FastData SX/20*

25% faster than a 16mhz SX, the FastData SX/20 adds even greater performance to its 386 multitasking capabilities. Just \$200 more than our SX/16, this machine also includes an 80mb hard drive in addition to the super VGA color monitor and 16 bit VGA adaptor, Keytronic keyboard, DOS 4.01 or 5.0, and two floppy drives. The system includes two megabytes of memory and is expandable to eight on the main system board. Remember, when you have questions, need to solve a problem, or want recommendations on products for your system, the FastMicro team is standing by toll-free to provide product support for as long as you own your FastData personal computer.

Standard Features

- ✓ 20mhz Intel™ 386-SX processor.
- ✓ 2 megabytes of high speed RAM.
- ✓ 80 mb 20ms IDE hard disk, 1:1 interleave.
- ✓ 1.2mb 5.25" and 1.44mb 3.5" floppy drives.
- ✓ Standard chassis (shown) or mini-tower with keylock, speed and reset buttons.
- ✓ 200 watt power supply
- ✓ 14" Super VGA color monitor with 16 bit VGA card with 512K.
- ✓ Clock calendar, parallel port, two serial ports, and game port.
- ✓ Key Tronic 101 key keyboard.
- ✓ 8 expansion slots, 5 drive bays.
- ✓ 80387-SX coprocessor socket.
- ✓ Full Shadow RAM and LIM 4.0 EMS support.
- ✓ Windows & Mouse add \$69.
- ✓ MS-DOS 5.0.
- ✓ FCC Class B approved.

386/SX20	40mb	80mb	100mb	200mb
Mono	\$969	\$1,099	\$1,169	\$1,419
Mono VGA	\$1,069	\$1,199	\$1,269	\$1,519
VGA Color	\$1,219	\$1,349	\$1,419	\$1,669
VGA 1024i	\$1,269	\$1,399	\$1,469	\$1,719



\$1249 *FastData 386/SX*

Combine the benefits of an advanced Intel 386 processor, the value of a 286 and the advantages of FastData and you've got the FastData 386/SX! This machine is the choice of those who want to run today's powerful 386 and multitasking software, like Windows, and also want to run their favorite DOS applications at surprising speeds. We've made our customers' favorite options standard: it comes with an ample two megabytes of memory, a high performance 40mb hard drive, and 16 bit super VGA. Compare performance, features, and service and you will find no better SX value. Interested further? Try the FastData 386/SX for 30 days; you have to be happy - if not, we'll take it back.

Standard Features

- ✓ 16mhz Intel™ 386-SX processor.
- ✓ 2 megabytes of fast RAM.
- ✓ 40 mb 28ms IDE hard disk, 1:1 interleave.
- ✓ 1.2mb 5.25" and 1.44mb 3.5" floppy drives.
- ✓ Standard, mini tower, or mini desktop (shown) chassis with keylock, speed and reset buttons.
- ✓ 200 watt power supply
- ✓ 14" Super VGA color monitor with 16 bit VGA card with 512K.
- ✓ Clock calendar, parallel port, two serial ports, and a game port.
- ✓ Key Tronic 101 key keyboard.
- ✓ 8 expansion slots, 5 drive bays.
- ✓ 80387-SX coprocessor socket.
- ✓ Full Shadow RAM and LIM 4.0 EMS support.
- ✓ Windows & Mouse add \$69.
- ✓ MS-DOS 5.0.
- ✓ FCC Class B approved.

386/SX16	40mb	80mb	100mb	200mb
Mono	\$949	\$1,079	\$1,149	\$1,399
Mono VGA	\$1,049	\$1,179	\$1,249	\$1,499
VGA Color	\$1,199	\$1,329	\$1,399	\$1,649
VGA 1024i	\$1,249	\$1,379	\$1,449	\$1,699

FASTMICRO
1-800-821-9000



FastMicro
3655 E. LaSalle St.
Phoenix, AZ 85040
(800)821-9000 (602)437-5700
(602)437-2300 FAX

© 1991 FastMicro, Inc. All trademarks acknowledged. Add 3% for shipping.

DISK DRIVES

CD-ROM	
Hitachi Ext 680mb Kit.....	499
Sony Int. 680mb Kit.....	379
Book of Mammals / Enclopedia.....	49/69
MS Bookshelf, Stat Pack.....	
World Atlas & Consultant CDs.....	99
Colorado	
DJ-10 40-120mb Int. Tape.....	239
DJ-20 80-240mb Int. Tape.....	299
External Kit.....	69

Toshiba 100mb IDE Kit

\$369
Upgrade your 286 to 100MHz technology and Toshiba quality at a FastMicro price. This kit comes with a fast 200ms 100mb drive and built-in 1.1 controller, 16 bit IDE card with dual floppy controller & cables, 5.25" brackets & rails.

Conner (see FastData IDE controllers)
CP3044 40mb IDE 28ms.....199
CP3104 100mb IDE 25ms.....349
CP3208 200mb IDE 25ms.....599

DTC
6280 ESDI 16bit HD/FD Cont.....119
6280-15T 15mb/sec transfer rate.....169
Micropolis (see DTC Controllers)
MC1664 345mb HH ESDI 14ms.....1099
MC1568 668mb FH ESDI 14ms.....1499
MC1518 1.3gb FH ESDI 14ms.....2595

Plus Development
HardCard IXL 50mb 9 ms 16bit.....399
HardCard IXL 105mb 9 ms 16bit.....579

Seagate
89mb AT Kit \$319
IDE performance, big 89 megabyte capacity, 19ms access time and 5 mbps transfer rate make this a great buy. Controller, cables and rails are included to make installation fast and easy.

Seagate
30MB XT Kit ST238 w/ cont.....249
40MB AT ST251-1 MFM Drive.....229
40MB AT ST157A 28ms IDE Drive.....179
89MB ST3096A 19ms IDE Drive.....299
125MB ST1144A 19ms IDE Drive.....359
210MB ST1239A 15ms IDE Drive.....599
330MB ST2383E 16ms ESDI Drive 1199

Teac
1.2MB 5.25" Floppy.....65
1.44MB 3.5" Floppy.....65

Toshiba
1.44mb Floppy \$59
Complete with mounting brackets and installation instructions, this Toshiba works in all true 286 & 860 compatibles. Will also read/write format 20K 1.5" disks. Rails add \$5.

Toshiba
360K 5.25" Floppy (Black).....59
1.2MB 5.25" Floppy.....59
1.44MB 3.5" Floppy.....59
107mb 1034 IDE 3.5" drive.....349

Western Digital
WD93044 40mb IDE 28ms.....199
WDAC280 80mb IDE 20ms.....299
WDAP4200 200mb IDE 20ms.....599

MODEMS & FAX

ATI
2400 ETC Internal / External.....129/159
8514/Ultra+VGA 1mb.....599
9600/E External MNP V.42bis.....369

ATI \$369 9600ETC-E
ATI delivers speed and accuracy with the 9600 ETC-E. It includes V.42 LAP-M, and MNP error correction combined with MNP/5 and V.42 bis data compression to provide total high speed throughput. It features automatic line speed correction, synchronous/asynchronous communication and automatic feature negotiation with connecting with other modems.

Everex 2400B Int Modem
Hayes
JT FAX 4800B Internal.....139
Personal Modem 2400 w/Prodigy.....119
Pocket Edition 2400 Modem.....119

Intel
Classic 2400 Modem Int/Ext.....139/169
Satisfaction Classic - Int/Ext 9600.....379

OmniLink Laser \$379
Don't settle for curled-up thermal paper or tie up your PC to receive faxes. Get OmniLink Laser. It connects to your phone line and HP compatible laser and receives and prints your faxes. You can still print anytime you want and OmniLink will store up to 30 faxes while your printing. Plus, it's a standard 2400/9600 modem/sendfax and software is only \$89.

Practical Peripherals
2400B Int Modem.....125
2400B Int with MNP.....159
PM9600SA Ext. V.32/V.42bis.....449

USRobotics
2400 Sportster Int / Ext.....119/135
2400 Sportster MNP Int / Ext.....159/189
Courier HST 14,400 Int. / Ext.....539/579
Courier HST 14,400 Dual Std Ext.....839

ZOOM
HC2400 Internal.....69
2400 V.42bis External Modem.....159
9624 Send/Receive Int Fax Modem.....119

MICE & INPUT

Key Tronic 101 Keyboard.....59
Professional Mouse.....59

Logitech
Mouseman Serial nighthand.....59
Mouseman Serial with Windows.....127
Mouseman Bus nighthand.....76
Mouseman Cordless.....129
ScanMan 32.....159
ScanMan 32 with Catchword.....199
ScanMan 256 for Windows.....279
Trackman Serial.....75

Microsoft Mouse \$83
Ergonomic design and 400 DPI accuracy make this the world's most popular mouse. Microsoft design and mouse utilities assure compatibility with the programs you use most.

Microsoft
Serial or Bus Mouse only.....83
Serial or Bus with paint.....95
Serial with Windows.....147
Z-Nix Super Mouse II w/Windows 79



NETWORKING

Artisoft/Lantastic
Lantastic Two Station Starter Kit
2 Mbps.....349
Ethernet.....469
Ethernet Additional Stations.....209
Novell
Netware Lite.....Call

FASTDATA PRODUCTS

FastData 16 Bit VGA \$69 \$89
The FastData 16 bit VGA card features 256K of video memory, does CGA, EGA, & VGA up to 1024x768 and comes with drivers for popular software including Windows 3.0. It's expandable to 512K and has a 30 day money-back guarantee.

FastData 16bit 1mb VGA.....99
FastData CGA Card.....35
FastData MGP Card.....29

FastData Monitors
Your best value guaranteed! We have full line manufactured for us by manufacturers like Hyundai and Matsushita (Panasonic). As with all FastData branded product, you get a full 30-day money back satisfaction guarantee. Shown is the VGA color.

BOARDS & CHIPS
Brown Wagh
Sound Blaster.....109
Sound Blaster Pro (stereo & MIDI).....189
Everex
RAM3000 16 bit - w/ 0K (max 3mb).....75
RAM3000 16 bit - w/ 1mb.....135
RAM8000 16 bit - w/ 0K (max 8 mb).....169
RAM8000 16 bit - w/ 2mb.....289
Intel
287XL.....85
387-DX25 or 33.....209
387-SX16 / 20.....129, 139
Memory - 1mb SIMMS 80ns \$59
Memory - 1mb chips 80ns set of 9 \$59

9600B SendFax w/ 2400B Modem.....99
9600B Send/Receive Fax w/2400B.....119
Ethernet 16bit 10Base-T.....129
IDE 16 Bit 1:1 Hard/Floppy Disk Cont.....29
IDE HD/FD w/Par/2 Serial/Game.....39
Parallel/2 Serial/Game Card.....29
RL 16bit 1:1 Hard/Floppy Disk Cont.....59
XT 1.44 Dual Floppy Controller.....35

FastData 2400 Baud Modem \$59
The FastData 2400 baud internal modem is fully Hayes compatible and can be configured to COM port 1-4. It has an internal speaker, is auto answer & auto dial, and comes with communications software.

FastData Monitors
14" Amber or White Monochrome.....99
14" White VGA Monochrome.....119
14" CGA Color .52 dot pitch.....199
14" VGA Color .31 dot pitch.....279
14" Super VGA 1024 x 768 .28 dp.....319
14" Non-Int VGA 1024 x 768 .28 dp.....429

VIDEO & MONITORS

ATI
VGA Basic 16 / Integra.....75 / 129
VGA Wonder + 256K / 512K.....159 / 189
VGA Wonder XL 256K / 1mb.....189 / 259
8514 Ultra 8514+VGA 1mb.....599

Diamond
SpeedStar Plus HiColor 1mb.....189
Everex EGA 480 Card.....69
FastData Monitors & Cards see above
Hercules Graphic Card + MAG Colorview/15.....Call
Mitsubishi
1410 EGA.....325
Diamond Scan 1381.....499
Diamond Scan 16L.....919

NEC
Multisync GS 2a.....199
Multisync 3FGX.....Call
Multisync 4FG.....Call
Orchid ProDesigner II 1mb.....279

Paradise
Basic VGA - 8 bit.....99
VGA 1024 256K/512K.....149 / 179
Panasonic C1381 VGA.....369

Seiko
CM1440.....499
CM1450.....639
Sony 1304 Multiscan.....629

Video 7
VGA 1024/256K / 512K.....129 / 149
V-RAM II VGA 512K / 1mb.....249 / 319
Zenith 1492.....599

Sound Blaster \$149
Sound Blaster does for sound what VGA does for graphics! Supported by the largest software library, Sound Blaster make your games come to life. Also includes a music synthesizer, voice input and sound conversion, and MIDI interface. SB Talker even converts text into spoken English. Includes a game port also.

PRINTERS

Canon
BJ10XE Portable.....319
BJ300 / BJ330 Ink Jet.....459 / 599
LBP-4 Laser.....799

Citizen
200GX 9 Pin.....159
GSX-130 24 Pin.....249
GSX-140 24 Pin.....295
GSX145 24 Pin Wide.....395
PN48 Std / Pro.....299 / 329
Fujitsu DL3400.....359

NEC
P3200 24 Pin.....269
P3300 24 Pin Wide.....369
P6200 / 6300.....469 / 629
Silentwriter 2 Model 90.....1550

Okidata
Okilaser 400.....669

Panasonic
KXP1180 9 Pin.....155
KXP1123 24 Pin.....239
KXP1124 24 Pin.....289
KXP1624 24 Pin Wide.....369
KXP2624 24 Pin Quiet.....459
KXP4400 Laser.....699
KXP4450 / 4455 Lasers.....Call
Seiko Smart Label Printer Plus.....167

Star
NX1001.....149
NX2410 / 2415.....239 / 369
XB2410 / 2415.....419 / 539

Texas Instruments
MicroLaser PS17 \$1199

PostScript laser printing has never been so affordable. The TI PS17 includes 1.5mb of memory, PostScript by Adobe, and 17 standard fonts including Times, Helvetica, Courier and Symbol. It handles paper up to 8.5 x 14" and envelopes too!

Texas Instruments
MicroLaser PS17.....1199
MicroLaser PS35.....1499

FastData 286/12

\$699

Imagine a fast 286 computer at a super price and you've got the FastData 286/12. This system is complete, not stripped. You get one megabyte of zero-wait-state memory and a 28ms IDE hard disk - standard. Also included is an amber monitor and graphics card, your choice of a high density 1.2mb or 1.44mb floppy drive and a Key Tronic keyboard. And since it's a FastData, you are backed with toll-free technical support, one year warranty with the FastShip replacement program & on-site service plan, and our 30 day full money-back satisfaction guarantee!

- ✓ 12mhz 80286 processor.
- ✓ 1 megabyte RAM.
- ✓ 40 mb 28ms IDE hard disk 1:1 interleave.
- ✓ 1.2mb 5.25" or 1.44mb 3.5" floppy drive (2nd drive add \$59)
- ✓ Standard chassis (shown)
- ✓ Five drive bays.
- ✓ 200 watt power supply.
- ✓ Math coprocessor socket

- ✓ Monochrome monitor with monochrome graphic board.
- ✓ Clock calendar, parallel port, game port, & 2 serial ports.
- ✓ Key Tronic enhanced 101 keyboard.
- ✓ 8 expansion slots, 6 available.
- ✓ MS-DOS 5.0.
- ✓ Full documentation.
- ✓ FCC Class B approved.

286/12	40mb	80mb	100mb	200mb
Mono	\$699	\$829	\$899	\$1,149
Mono VGA	\$799	\$929	\$999	\$1,249
VGA Color	\$949	\$1,079	\$1,149	\$1,399
VGA 1024i	\$999	\$1,129	\$1,199	\$1,449

DATABASE & FORMS

askSam 5.0	209
Clanon Personal Developer	45
Clanon Professional Developer	449
Clipper 5.01	489
DataEase	509
dBase III+	439
dBase IV	479
dBXL Diamond	129
Formbase	299
FormTool Gold	299
Formfiller	85
Foxbase Plus	179
FoxPro 2.0	449
Paradox 3.5	489
Paradox Competitive Upgrade	169
Paradox SE	65
PerForm Designer & Filler	89
Personal Rbase	79
Q & A 4.0	249
RapidFile	99
Rbase for DOS	447
Reflex	159

Personal R:Base \$79

Who says powerful relational databases are expensive? Not with Personal R:Base. It has intuitive pull-down menus that let you query your data, build quick forms and reports automatically, and even build applications without complex programming. You can import from and export data to other formats and even dynamically reads and writes dBase files.

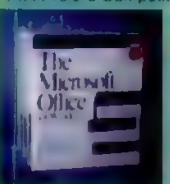


ENTERTAINMENT

Carmen SanDiego Deluxe Edition	45
F-19 Stealth Fighter	38
King's Quest 5 (VGA Vers.)	38
Leisure Suit Larry III	35
Microsoft Flight Simulator	38
Aircraft & Scenery Designer	27
PC Globe or PC USA	35
Simsity	28
SmEarth	39
Wing Commander I / II	45

WINDOWS SOFTWARE

3-D Charts to Go for W	85
ACCPAC Simply Acctg for Windows	119
Adobe Illustrator	309
Adobe Streamline	119
Adobe Type Sets	Call
Adobe Type Align	59
Adobe Type Manager	59
Adobe Type Manager Plus Pack	115
After Dark for Windows	25
Ami	115
Ami Pro 2.0	287
Ami Pro 2.0 Competitive Upgrade	119



Microsoft Office \$447

This special bundle includes the leading Windows applications: Excel, Word, and PowerPoint all in one Excel is the top rated graphical spreadsheet, Word is the #1 selling Windows word processor, and PowerPoint is the top presentation package. Act now and you will save half the cost if purchased separately.

Asymetrix Toolbook	279
Becker Tools Plus	Call
Bitstream Facelift	57
Corel Draw 2.0	359
Correct Grammar	57
Current	Call
DBFast/Windows	239
DynaComm 3.0 Async	139
Excel	299
Facelift	57
Form Publisher	139
Grammatik IV for Windows	55
HDC First Apps or Windows Express	55

1-2-3 & Ami Pro Double Upgrade \$139 wow!

Lotus users? This upgrade includes the hot new 1-2-3 for Windows and the new Ami Pro 2.0 1-2-3/W. Includes SmartIcons 3-D charting, true 3-D worksheets and database links. Use Windows pull-down menus or press slash and Classic 1-2-3 menus appear. Ami Pro 2.0 is the new version of the award winning Windows word processor. It includes new customizable SmartIcons 1-2-3 data exchange, outlining, style sheets, revision marking and more.



DESKTOP PUBLISHING

Adobe Postscript Cart. for HPLJ-II	299
Bannermania	21
Express Publisher	Call
Microsoft Publisher for Windows	129
Pagemaker 4.0	489

Microsoft \$129 Publisher

New Microsoft Publisher for Windows gives you easy-to-use page layout text and graphics tools to create publications quickly. It includes a built-in word processor with spell-checker and import text from any major word processor. Also includes PageWizard, step-by-step publication creation. WordArt, text special effects, and Toolbars, access to frequently used functions are a click away. Also comes with 100-clip art images, border art, drawing tools & more.



PFS First Publisher	89
Printshop	33
Publisher's Paintbrush	279
Publish It!	129
Ventura Publisher Gold / Windows	519

FINANCIAL

ACCPAC BPI Value Pak	359
ACCPAC Simply Acctg for Windows	119
Bedford Integrated Accl	119
DAC Accounting 4.2	79
DAC Bonus Pack 2	119
Dollars & Sense	55
Managing Your Money	109
Microsoft Money for Windows	45
Money Matters	49
One Write Plus G/L, A/P & A/R	165
Pacioli 2000	35
Peachtree Crystal Acctg Windows	139
Peachtree Complete III	139
Peachtree with Data Query	209
Quicken	41
The Manager's Organizer	139
Timeslips III	179
Wealth Builder	89



Windows 3.0 \$89

Get in on the Windows revolution! Windows turns your 286 or above into a powerful multitasking workstation that runs even non-Windows applications. Includes many integrated applications standard. Plus, if you buy Windows from FastMicro, we'll throw in 12 of the best Windows shareware programs free!

Micrographix Draw +	149
Micrographix Designer	449
MicroPhone II	199
Microsoft Entertainment Pack	27
Microsoft Mouse + Windows 3.0	147
Microsoft Office Word Exec. Powerpoint	447
Microsoft PowerPoint for Windows	309
Microsoft Productivity Pack	39
Microsoft Windows Developer's Kit	309
Microsoft Word for Windows	299
M Y O B	129
Norton Backup	85
Norton Desktop	95
ObjectVision for Windows	89
On Target	259



\$129

New Microsoft Works for Windows is the easy-to-use integrated software for Windows that's designed with small business users in mind. It includes a Word processor with Speller and Thesaurus, Spreadsheet with chart, Database with report generator, and Drawing tools to design graphics you can paste into your word processing document. On-line help is a click away and WordWizard guides you through the process of creating custom documents.

PackRat 3.0	239
Packmaster 4.0	489
Persuasion	319
Per Form Pro	Call
PFS WindowWorks	119
Pro Write Plus	159
Project for Windows	429
Publisher's Powerpak	279
Publisher's Paintbrush	279
RightWriter for Windows	Call
SuperBase 4	419
Turbo Pascal for Windows	Call
Ventura Publisher	519
WideAng e for Windows	62
Winconnect	59
Windows 3.0	89
WinFax Pro	69



We Ship Air at Ground Rates

GRAPHICS

Autosketch 3.0	139
Corel Draw 2.0	359
Design CADD 3-D	185
DrawPerfect	259
Freelance Graphics 4.0	299
Freelance Competitive Upgrade	89
Genetic 3D Drafting	199
Genetic Cadd Level 2 Starter Kit	89
Genetic Cadd 5.0	279
Harvard Graphics	Call
PC Paintbrush IV Plus	109

PC Tools \$99 Deluxe 7.0

New PC Tools 7.0 is the perfect set of utilities for DOS 5. Includes new application menu system, remote operation of another PC, advanced data recovery and enhanced Backup II. DOS and Windows versions. Anti-Virus, which recognizes over 400 known viruses and even detects unknown ones, included as a free bonus.



INTEGRATED

First Choice	95
Framework XE	95
Geoworks Ensemble	115
LotusWorks	89
SmartWare II	417
Symphony 2.2	489
Works	89
Works w MS Serial Mouse	149

PROGRAMMING

Borland C++	299
Borland ObjectVision for Windows	89
Turbo Pascal Dos/Windows	90/Call
Macro Assembler	95
Microsoft C Compiler	303
Quick Basic	60
Quick C or Quick Pascal	60
Visual Basic for Windows	125
Windows Developer's Kit	309

SPREADSHEETS

Allways	115
Excel for Windows	299
Lotus 1-2-3 version 2.3	325
Lotus 1-2-3 version 3.1+	399
Lotus Upgrades	Call

Lotus 1-2-3 2.3 \$325

The powerful spreadsheet that runs on any PC. New WYSIWYG displays, mouse support, 300 graph types, drawing tools and other graphics features. It makes spreadsheet publishing a breeze. Release 2.4 also adds auto-compress printing, automatic file viewer, context sensitive help, print preview and more. Call us for upgrade information too!



Quattro Pro 3.0	309
Quattro Pro 3.0 Comp. Upgrade	89
Quattro Pro 3.0 SE	47
Supercalc 5.1	89

WORD PROCESSORS

Facelift for WordPerfect	57
Grammatik IV	55
LetterPerfect	119
Multimate 4.0	267
Professional Write	159
Publisher's PowerPak / WordPerfect	Call

WordPerfect 5.1 \$239

WordPerfect is the #1 rated word processing software. Its got almost every feature imaginable and yet it's easy to use. The current version adds and down meters, mouse support, tab creation and quotation edit. Add this to the best software support in the business and you can't go wrong!

Rightwriter	55
Spnrt	117
Word	209
Word Perfect 5.1	239
Word Perfect for Windows	269
Word Perfect Add'l Station	159
Word Perfect Office	89
WordStar Professional	Call
Writer's Toolkit	79

UTILITIES

386 MAX	59
Address Book Plus	45
Calendar Creator Plus	39
Central Point Backup	79
Checkit	79
Company Ladder	45
Control Room	69

MS-DOS 5.0 \$55

The new Microsoft DOS 5.0 frees 45K or more for DOS on 286 & 386 PCs. It includes a new Shell, UnDelete and Unformat, new Editor and more. Also includes Qbasic, Command

Line Help, new Backup and Windows enhance. Plus, you can install it on your drive without reformatting, even on Networks. This optional upgrade pack requires that you simply have another command.com on your drive!

CoreFast	60
Carbon Copy Plus	105
Desqview 2.4	75
Desqview 2.8 2.4/6.0	125
Direct Access	57
Disk Manager Dos / Novell	36 / 95
Disk Optimizer	29
DR DOS 5.0	Call
GoScript 3.0	89
Fastback Plus	109
Headroom	59
Hijaak 2.0	95
InfoSpotter	45
Labels Unlimited	45
Laplank III	85
Mace Utilities 1990	88
Microsoft Learning DOS	32
MS-DOS 5.0 Upgrade	55
Norton AntiVirus	79
Norton Backup	90
Norton Commander	90
Norton Utilities 6.0	109

Stacker \$79

Stacker doubles the capacity of your hard disk in minutes without reformatting. It compresses files in the back ground transparently giving you the extra room you need. For higher performance, Stacker software with coprocessor card (81-99) is an easily installable hardware solution which gives you hard disk, now, less on file.



PC Anywhere IV	95
PC Tools Deluxe 7.0	99
Personal Lawyer	34
P.D. Queue	55
PFS Preface	47
Pop Drop Plus	53
PrintRite	55
ProComm Plus	65
Prodigy	25
QA Plus	85
QEMM 386 6.0	59
QRAM 2.0	49
SideKick 2.0	59
Sideways	55
Smartcom Exec	69
Super PC Kwik	43
Virex-PC	75
XFree Gold 2.0	89

FAST MICRO



For Pricing on Other Products or to Order, Call Toll-Free (800) 441-3278



TERMS: No Charge for Visa, MasterCard or Discover Card. All orders up to 20 pounds are shipped via Federal Express. Minimum order \$50. Shipping & handling charge 3% (Min \$6).

Product warranties, offers & claims are handled by the manufacturer. FastData branded products are warranted through FastMicro's Comprehensive No Return / No Refund / No Exchange (NRRN) policy. No returns on used items except FastData branded products. All opened software, regardless of 15% discount, for all FastData branded products. DOA's repaired or replaced at our option. Call for return authorization (RA) before returning product. Shipping is not refundable. Sorry, no COD's. Personal/company checks delay shipping. AK, HI, & APO addresses add \$15 per box. Prices/availability subject to change. Purchase orders accepted on purchases from approved corporations only. AZ orders add 6.7% tax. Mailing Address: FastMicro 9584 E. 1st Ave. Phoenix, AZ 85040. Telephone orders call (800) 441-3278. Computer orders call (602) 437-5700. For customer service call (602) 437-0300. FAX (602) 437-2800.

Save BIG on Computer Products



DRIVES AND BACKUPS

Conner Hard Drives	
3000 42MB 3.5" IDE 28ms	\$179
3100 104MB 3.5" SCSI 25ms	349
3104 104MB 3.5" IDE 25ms	349
3204 209MB 3.5" IDE 19ms	575
Seagate Hard Drives	
SEAST157A 40MB IDE 3.5"	179
SEAST280A 70MB IDE 5.25"	199
ST225 KIT 20MB w/Cont. XT	229
ST238 RLL 30MB RLL XT w/Cont.	239
ST251-1 40MB 28 MS 1/2 HT	249
ST4096 80MB 28 MS	489
Micropolis	
1355 159MB ESDI FH 28MS	469
1558 338MB ESDI FH 18MS	1199
1568 676MB ESDI FH 16MS	1299
Plus Development Hard Drive Cards	
Hard Card IIXL 50MB	309
Hard Card IIXL 105MB	459

Optical Drives	
Worm External 5.25" 940MB Drive	CALL
Worm Internal 5.25" 940MB Drive	CALL
Overwrite Ext. 5.25" 1GB Drive	CALL
Overwrite Internal 5.25" 1GB Drive	CALL
Mountain Internal Tape Backups	
40/120MB XT or AT	249
80/300MB AT	499
Archive Tape Back-up	
40MB Internal XT or AT	249
80MB Internal AT	325
Sony CD-ROM	
Ext. 7205 AT/XT w/Laser Library	CALL
Ext. 7201 PC XT/AT & PS/2	469
* Requires Interface Kit.	

FLOPPY DRIVES	
Toshiba Disk Drive Kits	
ND 04D 1/2 HT 360K (PC/XT)	\$59
ND 08DEG 1.2MB (PC/AT)	75
ND 356T 3.5" 1.44MB AT Kit	75
Sony Disk Drives	
3.5" 720K (PC/XT/AT)	59
3.5" 1.44MB Slimline	59
3.5" 1.44MB	59

MONITORS	
Panasonic 14" Color	
C1381i SVGA 1024 x 768 (.28mm)	\$349
C1395 SVGA 1024 x 768 non-interlaced (.28mm)	479
Packard Bell 14" Color	
8551VG VGA 640 x 480 (.51mm)	199
8539VG VGA 640 x 480 (.39mm)	249
8528SV SVGA 1024 x 768 (.28mm)	349
NEC Multisync Color	
2A 800 x 600 14"	419
3DS 1024 x 768 14"	599
4DS 1024 x 768 16"	999
5D 1280 x 1024 20"	2149
Sony 14" Color	
1304HG 1024 x 768 Multisync	599
1320 640 x 480 VGA	419

INPUT DEVICES	
Etronics Wotta-Shootah Joystick	\$10.99
Gravis Analog Joystick	31.99
IMSI Serial/Bus Mouse	39.99
IMSI Pet Mouse	19.99
Logitech Mouseman Combo	69.99
Logitech First Mouse Serial	39.99
Logitech Trackman Serial	69.99
Logitech Portable Trackman	99.00
Microsoft	
Ballpoint Mouse for Laptops	119.99
Bus or Serial w/Paintbrush	95.99
Microsoft Mouse Serial/Bus	79.99
Mouse System	
Omnimouse II	
w/Paint Bus/Ser.	49.99/35.99
PC Trackball Bus/Serial	
w/Designer DOS	59.99/44.99
Summa Sketch 12 x 12	339.99

SCANNERS	
Logitech Scanman 256	\$279.99
MouseSystems HandScan w/OCR	149.99
Panasonic Flatbed I, II, and III	CALL
Epson Desktop Color Scanner	1099.00

CORPORATE CUSTOMERS INVITED

We offer large bid opportunities. DUNS # 09-718-0517
OPEN ACCOUNTS-Net 30 terms available to D&B accounts rated 2A1 or better, actual freight charges FOB Skokie, IL. Phone (as above) fax orders to Corporate Accounts 708-677-7168, mail P.O.'s (as above) to Dept. C1132
PREPAID ACCOUNTS-Use Visa, MasterCard, check, money order (no cash or c.e.d.'s please) When ordering by mail please call in advance for shipping and handling charges. Shipments to IL add 7.75% tax. Minimum order \$15.00
 12/91

Monitor not included

PACKARD BELL COMPUTERS

THESE PACKARD BELL SYSTEMS INCLUDE:

- 2 Floppy Drives • Enhanced 101 Keyboard • 2-Button Mouse
- Tutorial • DOS 5.0 • QBasic • Free Software

PACKARD BELL

America's grow up listening to us. It still does.

Not affiliated with any former Bell System entity

1 YEAR ON-SITE WARRANTY

	FORCE	SX16N	SX16N+	820N	486SX
Processor		80386SX-16		80386SX-20	80486SX-20
Hard Drive		40MB	100MB	100MB	105MB
Stand. RAM		1MB	2MB	2MB (16K Cache)	4MB (8K Cache)
Max RAM		5MB		16MB (32K Cache)	32MB (128K Cache)
Expansion Slots		3 16-BIT		4 16-BIT	
Video Support		800 X 600 (256K) Memory		1024 X 768 (512K) Memory	
I/O Ports		15, 1P, 1M, 1G, 1VGA, 1KB		25, 1P, 1M, 1VGA, 1KB	
ELEK-TEK Price		\$899	\$1099	\$1399	\$1999

2400B Internal Modem with SX16N+, 820N & 486SX. Windows 3.0 with 820N & 486SX

Packard Bell 14" Color Monitors

8551VG	8539VG	8528SV
640x480 (.51mm)	640x480 (.39mm)	1024x768 (.28mm)
\$199	\$249	\$349

PACKARD BELL NOTEBOOK COMPUTER

386SXNB-2M	• Free Carrying Case	• 640 x 480 VGA	• 1 yr. depot warr.
• 80C386SX/20MHz	• 2MB RAM exp. 5MB	• 2400B Int. Modem	
• 40MB Hard Drive	• 3.5" 1.44MB FDD	w/send/fax	\$1999

MATH COPROCESSORS

Intel Math CoProcessors	
8087 (5MHz)	\$85
80872 (6/8 MHz)	119
80871 (10MHz)	159
80287XL (6,8,10MHz)	
and 80C287 (12MHz)	79.99
80287XLT Compaq LTE/286, and Tandy 2800	79.99
80387SX (16MHz)	119.99
80387SX (20MHz)	129.99
80387 (16, 20, 25, 33MHz)	199.00
80487SX (20 MHz)	459.00
Cyrix Math CoProcessors	
82587 (8-20MHz 80286)	79
83D87-16 (16MHz 80386)	179
83D87-20 (20MHz 80386)	179
83D87-25 (25MHz 80386)	179
83D87-33 (33MHz 80386)	189
83S87-16 (16MHz 80386SX)	109
83S87-20 (20MHz 80386SX)	119

CHIPS AND SIMMS	
256K (all speeds)	CALL
1MB (all speeds)	CALL
Simms Modules (all speeds)	CALL
Sipps (All Speeds)	CALL
ACCELERATOR/UPGRADE BOARDS	
Sata	
286I Accelerator	\$199
386SI Accelerator	299
Express 386SX 16MHz Upgrade	299
Express 386SX 20MHz Upgrade	349
I/O - II Drive Controller	89

TRONICS MODEMS	
▲ 100% Hayes Compatible	
▲ 2 year warranty	
2400 Baud Internal w/software	\$59
2400 Baud Internal w/V 42 &	115

DISKETTES	ELK-TEK	maxell.	SONY	3M	Verbatim
3 1/2" DSDD	6.50	7.99	7.50	7.99	7.50
3 1/2" DSHD	12.99	14.99	14.99	15.99	14.99
5 1/4" DSDD	3.99	5.50	5.50	5.99	5.50
5 1/4" DSHD (IBM AT)	7.50	9.99	9.99	9.99	8.99

* These products contain an 11th diskette in each box.

In addition to the above, we stock preformatted & color diskettes.

3M DATA CARTRIDGES

Regular		Pre-formatted	
DC100A (Mini)	\$14.99	DC600 HC/lotomat™	\$25.50
DC300XL/P	20.00	DC6150/Zetomat™	28.00
DC600A	21.00	DC2000/Kappomat™	19.00
DC6150	22.00	DC2000/Thetomat™	19.00
DC6250	26.99	DC2080/Rhomat™	20.99
DC6320	29.00	DC2120/Rhomat™	25.50
DC6525	34.00	DC2120/Ximat™	25.50
		2000 Tape Drive Cleaner	19.99

Call for Large Quantity Pricing.

Call for Wholesale Pricing on 3M Computer Tape.

SOFTWARE

AfterDark for	PC Anywhere
Windows	\$26.99 IV
Forside Computer	PC Kwik Power
Calendar	49.99 Pak V2.1
Corel Draw	369.99 PC Tools with
Fastback V3	119.99 Antivirus
LetterPerfect	129.99 ProCom Plus
Lotus 1-2-3 for	V2.0
Windows	399.99 Publisher's
MS Excel V3.0 for	Power Pak for
Windows	314.99 Word Perfect
Norton Commander	Quattro Pro
"While Supplies	QEMM 386 V6
Last"	\$29.99 w/Manifest
Norton Desktop for	Quicken V5.0
Windows	79.99 Stacker V2.0
Norton Utilities	99.99 Turbo Tax '91

We Stock 2500 Other Software Titles

LASER PRINTERS

Okidata Laser 400* Par /Ser.	
\$615/625	
Epson	
ActionLaser II**	699
EPL 7000** (with FREE 65-in-1 font)	799
EPL 7500** PostScript	1999
Panasonic	
4420* 8pgs/min.	705
4450i* / 4455* 11pgs/min	1099/1799

DOT MATRIX PRINTERS

EPSON	
LX810**	\$157
FX850**/1050**	289/399
LQ200**	225
LQ570**/1070**	268/369
LQ870**/1170**	446/615
LQ860** (Color)/2550* (Color)	549/859
DFX5000*/8000*	1289/2199

Panasonic	
1180** / 1695**	159 / 379
1123** / 1624**	199 / 339
1124** / 1654**	289 / 579
2624** Superquiet	389

OKIDATA	
320* / 321*	319 / 459
390+* / 391+*	459 / 639
393+* / 393C+*	979 / 1049
Diconix Ink Jet Printers	
150+ Parallel* / Serial*	329 / 339
*1 Yr. Warranty **2 Year Warranty	

HP LASERJET ENHANCEMENTS	
25-IN-1 Font Cartridge	\$259
1MB Memory Board IIP/III/IIID	99
2MB Memory Board IIP/III/IIID	149
Postscript Cartridge for IIP/IIID/III/IIID	349

MODEMS AND FAX BOARDS

Hayes and Hayes Compatible	
Hayes Internal	
2400 Baud No Software	1239
2400 Baud with Software	299
9600 Baud V.42 w/Software	499
Compatibles (including software)	
Practical Peripherals 2400 Baud	75
Practical Peripherals 2400 V.42	169
Practical Peripherals 2400 IBM PS/2	199
Practical Peripherals 9600 Baud	379
Hayes External (no software incl.)	
2400 Baud	329
2400 Baud Pocket Edition	129
9600 Baud V.42/V.42 Ultra	499/649
Hayes Optima 9600 Baud External	CALL
External Compatibles	
Practical Peripherals 2400SA	169
Practical Peripherals 2400SA V.42	199
Practical Peripherals 9600SA	459
Practical Peripherals 2400BPS	
Pocket Modem, "Credit Card Size"	99
Intel 9600 Baud with Software	459
All U.S. Robotics High Speed Models	CALL
Fax Boards	
Freecom Fax 96 Board	99
Freecom Fax / Modem	159
Intel SatisFAXtion Fax Board	CALL
Internal Practical Peripherals 2400	
Send/Receive FAX w/9600 send/recv.	139

Write for free catalog.

Prices subject to change; products subject to availability. Not responsible for printing or typesetting errors.

RETURN POLICY-All sales are final except defectives which will be replaced with identical merchandise only. Computers and large peripherals-3 work days after delivery; most small items, 30 calendar days, after which manufacturer's warranty applies. No returns will be accepted without an RMA number. Unauthorized returns and refused shipments subject to 15% restocking charge. ALL ELEK TEK MERCHANDISE IS BRAND NEW FIRST QUALITY AND COMPLETE. PC1211L

ET VALUELINE

WHERE MORE THAN JUST THE PRICE IS RIGHT

7350 North Linder Avenue, Skokie, Illinois 60077

800-395-1000 In IL: 708-677-7660

ET Valueline is the telemarketing and mail order department of Elek-Tek, Inc.

CIRCLE 294 ON READER SERVICE CARD

MORE FOR LESS

MORE=LARGEST SELECTION OF SOFTWARE TITLES
LESS=LOWER PRICES, LESS TIME WASTED TRYING TO FIND THEM



Compuclassics

Your Source for Software

Windows/
PFS:WindowWorks
Logitech
MouseMan
bundle

\$199



Tools you need to get up and running with Windows: Microsoft Windows,

PFS:WindowWorks, and the Logitech MouseMan, all in one package at tremendous savings! PFS:WindowWorks, the premier integrated program for Windows, features advanced word processing, spreadsheet, database, graphs and charts, communications! Logitech's MouseMan offers complete Microsoft compatibility.

Arc Tangent Zip++ is a compressed version of the 3.2 gigabyte U.S. Post Office file on a single CD-ROM! With a CD containing every valid address in the U.S. **\$116**

Arc Tangent Professional Mail generates and manages your entire mailing - highly personalized form letters to postal reports. **\$409**

Rightwriter
for Windows

\$59



The BEST way to improve your writing is now available for Windows—RightWriter—makes your writing clearer, more concise and powerful. RightWriter proofreads word processing documents for thousands of errors in grammar, style, word usage, and punctuation. As a result, you write better. And good writing is good business.

DR HALO IV Upgrade
Superior paint software. Features: SVGA support; popular file formats; improved printing; image enhancement functions; screen capture; font editor. Upgrade from any paint program. **\$49**

The Complete Writers Toolkit
\$85

The perfect gift for anyone that uses a word processor. Pop-up these reference tools within your word processor while you write. • Roget's II Electronic Thesaurus • The American Heritage Electronic Dictionary • The Concise Columbia Dictionary of Quotations • Houghton Mifflin's Abbreviation Program • The Written Word III - The Principles of Grammar and Style • The Houghton Mifflin CorrectText Grammar and Style Checker

Compuclassics
TO ORDER, OR INQUIRE CALL
800-827-1993
OR
818-347-7500
OR FAX YOUR ORDER
818-347-9977

W Indicates Windows Compatible Products

ACCOUNTING		MS Flight Simulator 4.0		Intel Netport Wire		PC Tools Deluxe 7.1	
Doc Easy Accounting 4.2	95	Sanity	39	Lantrast 2MBPS Adapter 4.0	495	PC Tools Deluxe w/CP Anti-Virus 7.1	109
Pacsoft 2000	35	Secure	33	Lantrast 2MBPS Starter Kit 4.0	359	Print Q 5.0	89
Pacsoft Double Bonus Bundle	219	Space Quest IV	42	Lantrast Ethernet Adapter 4.0	215	Printscope	105
Quickon 5.0	46	Wing Commander II	49	Lantrast Ethernet Starter Kit 4.0	499	QDOS III	49
Crystal Accounting 4.0	199	Casano Pack For Windows	25	NE 1000 Without Cable	129	QEMM 386 6.0	62
MS Money	49	MS Windows Entertainment Pack	29	NI 2000 Without Cable	165	QEMM w/Manifast 2.0	52
Simply Accounting For Windows	129	Sanity For Windows	39	Novell Lite	75	Spante II 2.0	64
CAD		FORMS/FLOWCHARTING		OPERATING ENVIRONMENT		Stacker Data Compress (Software)	
Autodesk 3.0	145	Flowcharting 3	139	Western Digital Plus Elite (16 Bit)	185	Stacker with 1.8k Board	189
Design Cad 2D 5.0	179	Formtool Gold 3.0	55	Western Digital Plus Elite (8 Bit)	155	System Sleuth Pro 4.0	79
Design Cad 3D 3.1	195	Interactive Easyflow 7.0	169	Wordperfect Office 3.0.1	89	Xtreme Gold 2.5	89
Dream Home Professional 3.0	45	Org Plus Advanced 6.0	65	Karcam Packet Ethernet Adapter 32K	389	Afterdark for Windows	30
Generic Cad 5.0	289	ABC Flowchart	189	Lantrast For Windows 4.0	182	HDC Icon Designer 2.0	37
Ortha Cad for Windows 1.1	439	Instant Organizing	129	PERSONAL INFORMATION		HDC Windows Express 3.0	59
COMMUNICATION		Par. Form Pro	129	DR DOS 6.0	69	Morton Backup DOS/Windows 1.2	92
CC Mail MS DOS Platform Pack	135	GRAPHICS		Desqview 386 2.4/6.0	129	Morton Desktop For Windows 1.0	99
Carbon Copy Plus 6.0	119	Deluxe Paint II Enhanced	85	Goworks Ensemble 1.2	125	Sitlock For Windows 3.0	82
Linklink Pro 4.0	89	Freelance Graphics 4.0	349	MS DOS 4.01	67	WinSketch	89
PC Anywhere IV (Host & Rem) 4.03	99	Harvard Graphics 3.0	419	MS DOS 5.0 Upgrade	59	WORD PROCESSING	
ProComm Plus 2.0	64	Hilask 2.10	95	HP New Wave	115	Fony On The Fly	105
Railcatcher 4 Plus 4.1	299	PC Paintbrush IV Plus 1.01	119	MS Windows 3.0	92	Glyphs Into Fonts For Wordperfect	69
Smartterm 3.0 1.2	129	PCP Pap	59	PERSONAL INFORMATION		Grammank IV 2.0	59
CC Mail Windows Platform Pack	335	Puzzle Plus 2.0	65	Autumn	58	MS Word W/Grammank 5.5	219
Close Up Customer Support/Team	135	Arts & Letters Graphics Editor 3.1	389	Biz Base Gold	225	Perfect Presentation For Wordperfect	55
Co Session (2 User)	105	Caval Draw Windows 2.0	369	Calendar Creator Plus 4.0	52	Rightwriter 4.0	59
Crosslink For Windows 1.2	122	MS Powerpaint for Windows	325	Infoselect 2.0	95	Screen Extender Wordperfect 2.0	59
Dynacomm Asynch for Windows	159	Micrograph Charsena 2.1	335	Timeline 4.0	375	Word Perfect 5.1	243
Fast for Windows	129	Micrograph Designer 3.1	445	Project Scheduler V	429	AMI Pro Competitive Upgrade 2.0	95
Winfax Pro	79	Micrograph Windows Draw	175	Timeline 4.0	469	AMI Professional 2.0	285
DATABASE		Prase 2.0	175	MS Project for Windows	459	Grammank Windows 2.0	59
Alpha/For Competitive Upgrade 1.1	99	INTEGRATED		On Target 1.0	279	MS Word for Windows 1.1	319
Arc Tangent Zip ++	409	Framework XE	99	PROFESSIONAL		Professional Write Plus	169
Blinker 1.5	229	MS PK Tools 2.0	99	Baker ICE For Lotus 2.2 & 2.3	259	Rightwriter For Windows 5.0	59
Clanon Professional Developer 2.1	459	PFS Fast Choice	99	Lotus 1-2-3 2.3	575	Wordperfect For Windows	279
Clanon 5.01	519	MS Office For Windows	509	Lotus 1-2-3 3.1+	409	UNIX/XENIX	
Dbase IV 1.1	489	MS Works For Windows	135	Quattro Pro 3.0	309	SCO Unix System V/386 Dev 3.2.2	719
Foxpro LAN 2.0	799	PFS Window Works	135	Quattro SE	92	SCO Unix System V/386 Op 3.2.2	719
Foxpro Single User 2.0	479	LANGUAGES		Sideways 3.3	59	SCO VP/IX 386 Unlimited 1.2.0	649
PC File 6.0	89	Asynic Professional	95	Supercalc 5.1	95	Wdperfect SCODEX/MX386 (5 User)	609
Paradox 3.5	499	Brammaker	149	Lotus 1-2-3 Windows 1.0	412	PRODUCTIVITY	
Paradox Competitive Upgrade 3.5	165	Base 3.1	179	Lotus 1-2-3 Win Camp Upgrade	95	Cyrix II Option Board PC/PS2 5.4	119
Paradox S.E.	69	Base Filter Multi-user 5.2	125	MS Excel For Windows 3.0	319	Cyrix 83587-25	145
Q & A 4.0	269	Can View	359	CSS Statistics	549	Intel 80387/DX Coproc 16,20,25,33	125
R & R Relational Report Writer 4.0	155	CTools Plus	92	On Write Deluxe 4.0	495	Intel 80387 SX-16 Coprocessor	135
DB Fast/Windows 1.55	255	MS Basic Development System 7.1	329	Derive 2.06	135	Galaxy Pioneer 2400 Ext Modem	165
Superbase 4 for Windows 1.3	435	MS C Compiles 6.0	329	Mathcad For DOS 2.5	309	Galaxy UFO V 32V 42bps 96Ext Mdm	145
DESKTOP PUBLISHING		MS Fortran Compiler 5.1	299	Mathematica 386w/387 Support 2.0	799	Hayes Pocket Modem 2400 Vsmartcom	129
Complete Writer's Toolkit	85	MS Layout 2.0	179	SPSS PC Base Module 4.0	185	Intel Soundtouch 9600 Classic	395
Horizons 3.0	75	MS Office 1.1	429	SPSS PC Base Statistics 4.0	269	Microport 542 Pocket Modem	305
Publisher's Powerpack/Wordpict/Word	46	MS Office Professional 1.1	125	Sigma Plot 4.1	435	Practical Modem 24 Int w/V 42bps	179
Ultraconcept PC 2.3	112	Smalltalk V 286 1.1	129	Stargraphics 5.0	629	Quicktel Int 24 Mdm MNP5 & 42 B5	125
Ultraconcept Plus 2.3	245	Source w/Bliss	155	System 5.0	659	Quicktel Int 9600 Send/Rcv For 2400	95
Ventura Publisher DOS/GEM 4.0	529	Turbo C ++ 2nd Edition	75	Math Type For Windows 3.0	169	Workpart 2496 Fax/Modem	339
Adobe Type Manager 1.1	65	Turbo C ++ W/Turbo Vision	139	Mathcad For Windows 3.0	309	Workpart 9600 Modem	485
Adobe Type Manager Plus Pack	125	Turbo Pascal 6.0	99	Mathematica For Windows 2.0	825	Zoom 2400V 42B5 MNP5 Int Mdm	162
Bitstream Fidelity 1.5	59	Turbo Pascal Professional 6.0	199	EDITING		Zoom 9600 Send/Rcv Fax Mdm Int	119
OmniPage Professional 2.0	655	Turbo Professional 5.11	89	386MAX 5.12	69	Zoom 9624 Send/Rcv Fax Mdm Ext	139
PageMaker 4.0	475	Turbo Vision Developer's Toolkit	95	Amidisk 3.16	59	Scramm 32	139
Publisher's Powerpack 2.0	285	Actar 4.0	195	Automate 4.7	39	Scramm 256	282
Readright For Windows	349	Barcland C ++ 2.0	319	Central Point Anti-Virus	79	Plus Hardcard IXL 105MB	609
Recognize OCR - Full Lang Ver.	529	Barcland C ++ W/Agg Framework	479	Check It 3.0	89	Plus Hardcard IXL 50MB	345
Ventura Publisher Windows 4.0	479	MS Quick C For Windows 1.0	135	Disk Manager (DOS) 4.21	45	ATI Graphics Ultra II - IMB	699
Wordscan Plus 786/386	699	MS Visual Basic	135	Disk Technician Gold	119	Video Seven Vltra II (512K)	265
EDUCATION		MS Windows Soft Dev TKit 3.0	329	Fastback Plus 3.0	99	Logitech Mouseman Cordless	109
Globolink Translate Basic (each)	292	Novell Bitwise For Windows 5.1	429	Netrom (1 User) 2.0	52	Logitech Mouseman Serial/Bus	75
Language Assistant - 4.1 (each)	45	Obeyvision 2.0	115	Netrom 110 User 2.0	159	MS Ballpoint Mouse	129
PC Globe 4.0	39	Realizer	305	Norton Antivirus 1.5	85	MS Serial Mouse w/Print	105
PC U.S.A. 2.0	39	Smalltalk Windows	289	Norton Commander 3.0	99	MS Serial Mouse w/Window 3.0	159
Typing Tutor 5 For DOS or Windows	35	Toolbook 1.5	295	Norton Utilities 6.01	115	Trackman Portable Serial	105
Video Learn Software Series (Each)	19	Turbo Pascal For Windows 1.0	129	NETWORKING		1-2-4 Plus Memory Board w/DMB	119
Where In The USA Game San Diego?	32	Zentech C ++ For Dos/Win 3.0	289	MS Windows Soft Dev TKit 3.0	329	1-2-4 Plus Memory Board w/2MB	245
World Atlas	39	AUDIO				Adobe Postscript Cartridge	299
ENTERTAINMENT		Soundblaster 1.5	129	386MAX 5.12	69	Pacific 4 Memory w/2MB for HP HP III	142
F117A Stealth Fighter (VGA) 2.0	49	Soundblaster Professional	205	Amidisk 3.16	59	Pacific Page Personal	365
Falcon 3.0	45	Disk Manager II (Novell) 3.12	129	Automate 4.7	39	Supra Cartridge 3 Professional	299
Jetflight II	45	Hayes Lan Shop	359	Central Point Anti-Virus	79		
King's Quest V - (VGA)	42			Disk Manager (DOS) 4.21	45		
Lesure Suit Larry V.GA	39			Disk Technician Gold	119		

★ No Minimum Orders
★ Same Day Shipping
★ Over 10,000 Titles Available

ASK YOUR SALES REP FOR
YOUR FREE T-SHIRT WITH
WINDOWS PURCHASE

Immediate shipment on purchase orders from government and state agencies, cities, counties, school and universities. • Prices subject to change without notice. • We ship the latest versions. • We accept Visa, MasterCard, Discover, JCB and American Express. • 2% surcharge on American Express and JCB. • 15% restocking fee for all non-defective items returned. • Please call (818) 347-9400 for an authorization number on defective goods or your return will not be accepted. • Due to copyright laws we cannot take back any software where the seal has been broken. • (Domestic Sales) \$6.00 minimum shipping per item, less on bulk orders. • \$10.50 (US) Label shipping. \$4.50 C.O.D. charge. • International sales call for freight pricing. • Heavier items are charged accordingly. • We do not guarantee compatibility. • Call for prices for any software item not included in this ad. • Order desk open 7 A.M. to 5 P.M. Monday to Friday (PST), Saturday 10 A.M. to 2 P.M. P.O. Box 10598, Canoga Park, CA 91309. • Showroom: 7959 Deering Ave., Canoga Park, CA 91304.

CIRCLE 205 ON READER SERVICE CARD

800-558-0003

Since 1982
ComputAbility
Consumer Electronics

800-558-0003

PMG 12/31

All Drives Include: Universal Installation Manual, AT Ralls & Cable

3.5" HALF HEIGHT DRIVES

ST-124 MFM	21 4MB	40MS	\$162
ST-138-1 MFM	32 MB	28MS	\$202
ST-157R-1 RLL	49 1MB	28MS	\$219
ST-157A IDE	44 7MB	28MS	\$165
ST-138N-1 SCSI	32MB	28MS	\$225
ST-157N-1 SCSI	48 6MB	28MS	\$205
ST-1096N SCSI	83 9MB	24MS	\$259

5.25" HALF HEIGHT DRIVES

ST-225 MFM	21 4MB	65MS	\$179
ST-251 1 MFM	42 8MB	28MS	\$222
ST-277R-1 RLL	65 5MB	28MS	\$249
ST-296N SCSI	84 9MB	28MS	\$255

SWIFT FAMILY 3.5" HALF HEIGHT

ST-1186A IDE	163MB	15MS	\$525
ST-1133N SCSI	113MB	15MS	\$565
ST-1239A IDE	21 1MB	15MS	\$569
ST-1201E ESDI	178MB	15MS	\$699
ST-1201N SCSI	171MB	15MS	\$559

3.5" LOW PROFILE DRIVES

ST-325N	21MB	28MS	\$165
ST-351A IDE	42MB	28MS	\$179
ST-3096A IDE	89MB	16MS	\$275
ST-3120A IDE	106 9MB	16MS	\$319
ST-3144A IDE	130MB	16MS	\$365

WREN FAMILY 5.25" FULL HEIGHT

ST-4182N SCSI	160MB	15 5MS	\$759
ST-4376N SCSI	330MB	17 5MS	\$1,099
ST-4376N NV	330MB	17 5MS	\$1,139
ST-4384E ESDI	329MB	14 5MS	\$1,149
ST-4385N SCSI	337MB	10 7MS	\$1,259
ST-4766E ESDI	676MB	15 5MS	\$1,299
ST-4766N SCSI	676MB	15 5MS	\$1,299
ST-41200N SCSI	1,050MB	17 5MS	\$1,779

SOUND BOARDS

Sound Blaster 1.5	\$119
Sound Blaster Professional	\$189
Sound Master II with Speaker	\$139
Ad Lib Music Card	\$79
AdLib Gold 1000/2000	\$179/245
Pro Audio Spectrum	\$239
Thunderboard	\$97

LANTASTIC

Artiscribe Digital Dictation	
Starter Kit	\$449
Artisoft Central Station	\$385
Lantastic for Windows	\$165
AE-3 ISA Adapter/Starter Kit	\$229/515
AE-2T Ethernet Adaptor	\$195
AE-2 Adaptor/Starter Kit	\$195/449
2 Mbps Adapter/Starter Kit	\$135/325
Z Two Station Kit	\$89
Peer Hub 10 Base/T	
Hub Connector	\$259
10 Base/T Starter Kit	\$579

Seagate**WREN FAMILY 5.25" HALF HEIGHT**

ST 2383A IDE	338MB	16MS	\$1,069
ST 2383E ESDI	337MB	16MS	\$1,069
ST 2106N SCSI	91MB	18MS	\$549

CONTROLLERS

ST-01 SCSI 8 Bit Adaptor	\$25
ST-02 SCSI 8 Bit Adaptor w/FD Control	\$39
ST-07 IDE Controller Hard Drive Only	\$25
ST-08 IDE Controller - HD & Floppy	\$35
ST 11M MFM 8 Bit Controller	\$45
ST-11R RLL 8 Bit Controller	\$45
ST 21M MFM 16 Bit Controller	\$39
ST-21R RLL 16 Bit Controller	\$39
ST 22M MFM 16 Bit Hard Drive & Floppy	\$45
ST 22R RLL 16 Bit - Hard Drive & Floppy	\$39

QUANTUM

SCSI 52MG / 105MG LPS	\$215 / \$335
SCSI 210 Pro Drive	\$659
IDE 52MG / 105MG LPS	\$205 / \$329
IDE 210 Pro Drive	\$639

MODEMS

Cardinal 2400 Int./Ext.	\$59/95
Cardinal 2400 Internal w/ Send/Receive	\$102
Cardinal 2400 Int. V 42 w/Snd/Rec 9600	\$175
Cardinal 9600 Internal V 32 w/ MNP5	\$285
Cardinal 9600 External V 42 w/ MNP5	\$335
QBlazer Modem 9600 V 32/V 42	\$489
U S Robotics Sportster Int. w/MNP5	\$129
U S Robotics Sportster Ext. w/MNP5	\$165
Zoom 2400 Internal/External each	\$65
Zoom 2400 Int. Send/Rec Fax 9600	\$109
Zoom 2400 Ext. Send/Rec Fax 9600	\$119
Zoom 2400 S/R 9600 for Windows Int	\$129
Zoom 2400 S/R 9600 for Windows Ext	\$139
Zoom 2400 V 42 BIS External w/MNP5	\$129
Zoom 9600 Int. V 32 / V 42 Bis MNP 5	\$365
Zoom 9600 Ext. V 32 / V 42 Bis MNP 5	\$365
Supra 2400 Internal w/ Mirror II	\$55
Supra 2400 External	\$79
Supra 2400 Plus Int. w/ MNP5 V 42 BIS	\$109
Supra 2400 Plus Ext. w/MNP5 V 42 BIS	\$129
Supra Fax Modem Plus 2400 Internal with V 42 & MNP5 for DOS/Win	\$129/145
Supra Fax Modem Plus 2400 External with V 42 & MNP5 for DOS/Win	\$149/165
SupraFaxModem V 32 Ext. DOS/Win	\$229/269

All Supra Modems come with a 5 year warranty

Complete PC

Commonwealth w/MNP5	\$295
Fax 9624 w/MNP5/V 42	\$329
Full Page, 256 Grayscale	\$329
Page Scanner w/Galera	\$519
Half Page 256 Grayscale	\$199
Half page Scanner w/OCR	\$259
Accounting Machine	\$225

VIDEO BOARDS

Video 7:	
Vega VGA	\$119
VRAMII 512K/1Meg	\$239/\$309
VGA 1024 256K/512K	\$127/\$148
Spea - FREE Delivery	\$1889
United Solutions:	
Image 800 8/16 bit 256K	\$55
Image 1024 256K/512K	\$79/\$89
Image Ultra 1 MB 1024 256 colors	\$139
Image Hi Color 1MB 1280 x 1024	\$149

PRINTERS

Panasonic NEW LOW PRICES!
Office Automation

KX-P 1180	\$149	KX-P 2624	\$365
KX-P 1123	\$199	KX-P 1654	\$525
KX-P 1124	\$273	KX-P 4420	\$699
KX-P 1624	\$325	KX-P 4450i	Call

CITIZEN

200 GX / GX-15	\$159 / \$299
GSX 130	\$239
GSX 140 PLUS	\$299
GSX 145 Wide -24pin	\$379
PN48 Notebook	\$289
Color Kit-200/GSX 140 PLUS	\$49
Color Kit 145	\$65

NX-1001 Multifont	\$139
NX-1020 Rainbow	\$179
NX 2420 Black / Rainbow	\$255/\$285
Star Jet 48	\$285
Laser Printer 4	\$849

DICONIX 180si Parallel**QMS POSTSCRIPT**

PS 410	\$1669
PS 815 / 825	\$2769/\$3349
PS 815MR / 825MR (dual bin)	\$3819/4509
Model 10P/10	\$4819 / \$5889
Model 30	\$8249

MICE/TRACKBALLS & HAND SCANNERS**MICROSOFT**

MS Serial Mouse - hardware only	\$89
MS Serial/Bus Mouse + Paint	\$99
MS Serial/Bus Mouse + Win 3.0	\$145
MS Ballpoint Mouse	\$122

LOGITECH

Dexxa Serial	\$29
First Mouse Serial	\$42
Scanman Model 32 (gray scale)	\$159
Scanman Model 256 (gray scale)	\$265
Mouseman RH Serial/Bus 400DPI	\$63/69
Mouseman Serial with Windows	\$105
Mouseman Bus with Windows	\$135
Trackman Serial/Bus	\$67/73
Trackman Portable	\$95
Mouseman Cordless	\$85

GOLDEN IMAGE

Jim 3 Button Mouse w/Driver Software	\$19
Brush Mouse	\$45
Hand Scanner 258 GrayScale 400 dpi	\$239

Colorado Memory

DJ10-120MB	\$239
ADAPTORS:	
AB11 Internal	\$37
KE10 External	\$109
DJ20 - 250MB	\$295
ADAPTORS:	
FC10 Internal	\$79
KE10 External	\$109
QFA-700 Int / Ext	\$709/939
ADAPTOR:	
TC02 Internal	\$239

Plus Development

Hardcard II XL 50 / 105	\$295/435
-------------------------	-----------

SyQuest Removable Media Drives

SQ 555, 44MB Bare Drive	\$309
SO 5110, 88MB Bare Drive	\$425
44/88MB Media Cartridge	\$79/125
Call for our Low Pricing on Int. & Ext. Kits for 44MB & 88MB SyQuest Drives!	

CHINON Floppy Drives

5 25" 360KB / 1.22MB PC/AT	\$54/59
3.5" with Frame 720KB PC/XT	\$51
3.5" with Frame 1 44MB PC/AT	\$59

Math Coprocessors

Only \$5 Shipping on Math Coprocessors

INTEL

287XL NEW	\$85	80387 SX-20	\$135
80387 SX-16	\$125	80387-16/20/25/33	\$199

CYRIX

82587	\$82
83587SX-16/20	\$114/125
83087-16/20/25 each	\$179
83087-33/40	\$192/\$219

IIIT

2C87-8	\$65	3C87-33	\$169
2C87-10	\$75	3C87SX-16	\$109
2C87-12	\$77	3C87SX-20	\$125
3C87-16/20/25	\$157		

MONITORS**PANASONIC**

NEW LOW PRICE!!!
Panasonic C1381I, \$309
.28DP, 1024 x 768

Panasonic C1395, Non-Interlaced .28DP, 1024 x 768	\$429
---	-------

PACKARD BELL

8539V, .39DP 640 x 480	\$219
8538SG, .39DP 1024 x 768	\$245
8528VG, .28DP 1024 x 768	\$315

SONY

1304 Non-Inter., 25DP 1024x768	\$589
--------------------------------	-------

MITSUBISHI

AUM 1391A Diamond Scan	\$489
------------------------	-------

IRWIN Tape Back-up

SLX 20A Adapter	\$69
Accutrak 120/250 STD Int.	\$185/\$239
Accutrak 120 Plus Int./Ext.	\$239/\$345
Accutrak 250 Plus Int./Ext.	\$299/\$379

Palidrome DAT Tape Back-Up

150/250 MB Int. / Ext.	\$1379/1649*
1.3 GB Internal/External	\$3169/3589*
2.2 GB External Drive	\$4459*

INCLUDES: Archiver Network Software & AT SCSI Card - call for Microchannel System prices. *FREE DELIVERY in the contiguous 48 states

PRODUCTIVITY

ACT 2.0	212 95
Address Book Plus V 3.0	48 95
Adobe Type Align for Win	60 95
Adobe Type Manager 2.0	60 95
Adobe Type Mgr + Pak	119 95
After Dark for Windows V 1.0	32 95
Alpha Four 1.1	288 95
American Heritage Dictionary DOS	55 95
Arni Professionals 2.0 for Windows	295 95
AMIDIAG	80 95
Arc List Mail Manager (new version)	375 95
Asymmetric Toolbook 1.5	278 95
Avapio 2.0	82 95
Auto Map	40 95
Automenu	35 95
Battery Watch Pro	28 95
Buz Base Gold V 2.1	159 95
Borland C++ 2.0	309 95
Calendar Creator Plus 4.0	54 95
Carbon Copy Plus 6.0	109 95
Check It 3.0	79 95
Clanor Person. Dev. V2.0	43 95
Clanor Pro Dev V2.1	445 95
Clipper 5.01	495 95
Close-Up 4.0/Custom Terminal bundle	122 95
Copy II PC 6.0	25 95
Corel Draw 2.0 for Windows	259 95
Correct Grammar 1.0 for DOS/Win	51 95/62 95
Co-Session (2 user)	97 95
dBASE IV 1.1	475 95
Dac Easy Bonus Pack 4.2	137 95
Dac Easy Accounting 4.2	89 95
Dac Easy Payroll 4.2	54 95
DB Fast for Windows 1.5	234 95
Data Perfect 2.2	265 95
Dehnitions Plus	58 95
Deluxe Paint Animation	82 95
Deluxe Paint II Enhanced	82 95
Design CAD 2D 5.0	165 95
Design CAD 3D 3.1	188 95
DESQview 2 V 2.4	79 95
DESQview 3 V 2.4	129 95
DESQview Companion V 1.1	59 95
Direct Access 5.1	62 95
Disney's Animation Studio	74 95
Distinct Back-Up for Windows	80 95
Dr. Solomon's Anti Virus Toolkit	459 95
Draw Perfect 1.1	255 95
Draw House Professional	39 95
Express Presenter DOS	147 95
Express Publisher V2.0	94 95
Express Publisher for Windows	177 95
Family Tree Maker V 2.0	39 95
Fast Back + 3.0	118 95
FastPak Mail 5.0	54 95
File F/X	70 95
Flow Charting 3	132 95
Form Filter 3.0	79 95
FormTool Gold 3.0	54 95
Formwork with Fill & File DOS 3.0	87 95
Formwork with Fill & File Win 2.0	\$177 95
FoxBase+ (single user)	182 95
Fox Pro 2.0	125 95
French Assistant	39 95
German Assistant	118 95
Grammatik IV 2.0 or 2.0 for Windows	184 95
Grasp 4.0	395 95
Harvard Graphics 3.0	395 95
Hypack V 2.1	93 95
Hyper ACCESS/5	55 95
Impress	70 95
Info Search 2.0	83 95
Info Spotter 5.0	43 95
Instant Recall V 1.2	62 95
Italian Assistant	39 95
Just Write for Windows	127 95
Labels Unlimited V 3.0	54 95
Laplink Pro 4.0	86 95
Letter Perfect 1.0	128 95
Lotus Agenda 2.0	279 95
Lotus 123 for DOS V 2.3	329 95
Lotus 123 for Windows	399 95
Math CAD 2.5 for DOS	298 95
Mavis Beacon Typing V 2.0	31 95
Mavis Beacon Typing V 2.0 for Win	37 95
Memory Commander	Call
Mirror 3 Fax	132 95
More Fonts V 3.0	71 95
MS Basic Dev Sys 7.1	314 95
MS C Computer 6.0	314 95

HOURS: CST
9am-9pm Mon-Fri
11am-5pm Sat.
800-558-0003

P.O. Box 17882
Milwaukee, WI 53217
(414) 357-8181
Fax (414) 357-7814

SHIPPING CHARGES
Order 1 or 1,000 software titles
& shipping in the contiguous
48 states is only **\$5** PER ORDER

177 95	MS C Computer 6.0	489 95	MS Windows 3.0	94 95
39 95	MS C Computer 6.0 V 4.5	565 95	MS Win Dev Tool 3.0	314 95
118 95	MS DOS V3.3	54 95	MS Word 5.5	209 95
54 95	MS DOS 4.01	59 95	MS Word for Windows 1.1	309 95
70 95	MS DOS 5.0 Upgrade	62 95	MS Works 2.0	92 95
132 95	MS DOS 5.0 w/Hologram	79 95	MS Works for Windows	125 95
79 95	MS Entertainment Vol 1, 2 or 3	28 95	Netroom Single User 2.0	49 95
54 95	MS Excel 3.0	299 95	Netroom 50 User	352 95
87 95	MS Flight Simulator 4.0	38 95	New PrintShop	36 95
\$177 95	MS Macro Assembler V 6.0	97 95	Data Disks, each	22 95
182 95	MS Mail 5W Station	265 95	New PrintShop Companion	30 95
186 95				

PC Magazine says... "Arlington

DoveFax™

NEW PRODUCT



Hardware Features:

- Combines a 9600 baud fax and a 2400 baud Hayes® compatible data modem
- CCITT Group III compatibility
- External Model

DoveFax for WINDOWS

- Full background send and receive capabilities
- Supports fine and standard fax resolution modes
- Group send capabilities
- Generates a cover page
- Supports gray scale dithering
- Broadcasting and scheduling
- On-line bulletin board
- On-line fax directory and fax phone numbers directory
- On-screen display of fax documents
- Automatic report logs fax activity
- Conversion of fax documents to a variety of formats

DoveFax for DOS

- Send and receive capabilities
- Supports fine and standard fax resolution modes
- Group send capabilities
- Generates a cover page
- Supports gray scale dithering
- Supports multiple phone books
- Allows phone book merges
- Accepts batch command lines
- Lifetime Warranty
- Rockwell Clip Set - Upgrade Path
- Customizable cover pages
- "Quickfax" capability
- "Pop-up" DOS application support with Epson printer support
- Includes data modem software with MNPS correction and compression
- Driver will load into EMS, if available

\$209.00

\$189.00

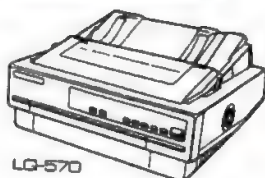
800-548-5105

EPSON

LQ-570

- 24-pin
- Prints 180 characters per second (CPS) in draft mode. 60 CPS in letter quality (12 CPI)
- Includes two scalable fonts, 8 to 32 points
- 12 built-in fonts
- Top, rear, bottom and front paper paths
- Fast print speeds up to 315 cps

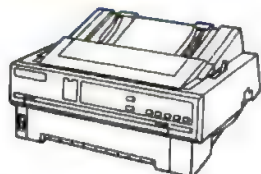
Scalable Fonts
Enhanced Graphics



LQ-570

\$255.00

LQ-870



LQ-870

With Epson ESC/P 2™
Control Language

- Includes two scalable fonts, 8 to 32 points
- 12 built-in fonts
- Top, rear, bottom and front paper paths
- Fast print speeds up to 413 cps
- Epson's most advanced dot-matrix business printer

Also LQ-1170 available with wide carriage - \$569.00

\$435.00



FX-1050

- 9-pin
- Epson's SmartPark™
- 264 CPS in high-speed: 54 CPS in near letter quality

Also LQ-850 available with narrow carriage — \$289.00



FX-1050

\$395.00

LQ-2550

- 24-pin
- 7-Color printing capability is standard
- Epson's SmartPark™
- 400 CPS draft; 133 CPS in letter quality mode (12 CPI)
- Epson LQ ESC/P™ assures software compatibility



LQ-2550

\$849.00

EPL-7000

Built with renowned Epson value and performance, the compact Epson EPL-7000 is an affordable easy-to-use laser printer that provides a high level of quality, reliability and compatibility.

\$789.00



EPL-7000

- 300 by 300 dots per inch resolution
- Fast six pages per minute speed
- Compatible with popular cartridge and soft fonts
- Prints superbly on a variety of paper
- 14 resident fonts

A R L I N G T O N C O M P U

offers worry free mail order purchasing!"

HEWLETT-PACKARD

Laserjet III w/Toner	\$1549
Laserjet IIP+ w/Toner	\$839
Laserjet IIP w/Toner	\$1059
1MG Upgrade	\$99
2MG Upgrade	\$129
4MG Upgrade	\$219
Extra Toners	\$79
Deskjet 500	\$409
Pacific Page/XL	\$329/\$699
Pacific CFL	\$259
Pacific Data 25 in 1 Font	\$249

EPSON PRINTERS

LX810	\$155	LQ570	\$255	LQ2550	\$849
FX850	\$289	LQ860	\$549	EPL7000	\$789
FX1050	\$395	LQ870	\$435	EPL7500	\$1909
LQ200	\$229	LQ1070	\$359	DFX5000	\$1269
LQ510	\$245	LQ1170	\$569	DFX8000	\$2139

Action Laser II \$689

OKIDATA PRINTERS

ML320	\$319	ML390	\$439	OLC 400	\$629
ML321	\$439	ML391	\$599	OLC 800	\$929
ML380	\$219	ML393	\$919	OLC 820	\$1239

PANASONIC

1123	\$199	1695	\$369
11241	\$275	2624	\$379
1180	\$149	4420	\$689
1624	\$339	4450I	\$1079
1654	\$539	4455	\$1729
4420/4450I	2MG Memory		\$149

CITIZEN

GSX140+	\$299	GSX200	\$159
GSX145	\$379	HSP500	\$299

NOTEBOOKS

Arlington 386, SX20,	
60 MG, VGA	\$1799
AST 43V, 386, 60 MG	\$2699
Epson NB3S, 40 MG	\$2199
Goldstar 620, 386SX20,	
40 MG	\$2149
Panasonic CF270,	
16 MHz, 20MG, VGA	\$1559
Panasonic CF270,	
16 MHz, 60 MG, VGA	\$1849
Panasonic CF370H6	
386SX-20, 60MG, VGA	\$2649

TEXAS INST.

TM 2000/20 MG	\$969
TM 2000/40 MG	\$1199
TM 3000/40 MG	\$2249
TM 3000/60 MG	\$2569
TM 3000/WINSX	\$2799
LASER STD	\$879
LASER PS17	\$1199
LASER PS35	\$1499

SOFTWARE

Aldus Pagemaker	\$489
Corel Draw	\$369
D Base IV	\$469
Harvard Graphics 3.0	\$389
Lotus 123 2.2/3.1	\$329/\$389
Microsoft Mouse	\$89
Microsoft Excel	\$299
Microsoft Windows 3.0	\$79
Microsoft DOS 5.0	\$79
Ventura Desktop Publ.	\$499
Word Perfect 5.1	\$249

COMPAQ

Model 386S w/40 MB	\$1899
Model 386E w/40 MB	\$2499
Model 386E w/100 MB	\$2699
LTE 286 20/40	\$1649/\$1899
LTE 386-60MB	\$3299
6 Month Warranty	

MULTIFUNCTION BOARDS

AST 6 Pack w/384K	\$159
AST Rampage Plus	\$329
Irma Board III	\$399
AST 5251-II Plus	\$499

Intel Above Board+	\$269
Intel Plus 8 w/2 MG	\$399
Intel 386 PC w/1 MG	\$459
Intel Satisfaxion	\$359
Intel Scanner Option	\$299
Intel Snap-In 386	\$359

DRIVES & TAPES

Ext. 1.2 for PSII	\$159
Toshiba 3 1/2" 720K	\$69
Toshiba 3 1/2" 1.44	\$69
Colorado Jumbo 120	\$249
Everex 40 MB Tape	\$209
NEC CDR-73	\$799

SEAGATE HARD DISKS

48 MB 3 1/2" (157N-Kit)	\$259
40 MB (157A)	\$169
40 MB for AT (ST251-1)	\$229
80 MB for AT (4096)	\$399
80 MG 296 Kit	\$299
89 MG 1102A	\$279
106 MG 3120A	\$369
120 MG 1144A	\$439
211 MG 1239	\$569

IOMEGA

90 MB Int. w/boot card	\$979
90 MB Ext. w/boot card	\$999

PLUS

Hard Card 40 MB	\$549
Hard Card 50 XL	\$309
Hard Card 80 MB	\$419
Hard Card 105 MB	\$459

CONNOR HARD DRIVES

40 MB	\$199
100 MB	\$349
200MB	\$589

MODEMS

Dove Fax Modem	\$189
Hayes Pocket 2400	\$119
Hayes Ultra 96	\$599
Intel 2400	\$139
Intel 2400 Ext.	\$159
Intel 2400 Ext. MNP	\$209
Intel 9600 Ext.	\$439
Intel 9600 14.4 Ext.	\$479
Mgltz 2400 Tosh/CPQ	\$129
Everex 2400	\$79
Everex 2400 External	\$169
US Robotics 9600	\$569
US Robotics Dual Std	\$779

CHIPS

256K/1 MG Chips, each	\$3/\$6
256K/1MB Simms	\$15/\$49
4MB Simms	\$189
Compaq 386 4 MB	\$279
Compaq SLT 2 MB	\$239
Compaq LTE 2MB	\$159
Compaq 386 4MB	\$399
HP 2MG Upgrade	\$129
IBM 2-8 MG Board	\$349
IBM 70 & 80 2 MB	\$129
OKI Laser 2MB	\$149



Intel 8087-2	\$109
80287-10XL/XLT	\$89
80387-16/80387-SX	\$195/\$129
80387 SX-20	\$139
80387-20/25/33	\$195
80487 SX	\$449

SCAN. & DIGIT.

Epson ES300C	\$999
Kurta XLP	\$249
Logitech ScanMan	\$159
Panasonic FXRS 3070U	\$939
Summasketch 12x12	\$309
Summasketch 12x18	\$559

NETWORKING

Netware 2.2 5 User	\$499
Netware 2.2 10 User	\$1099
Netware 2.2 50 User	\$1999
Lantastic 10BPS Starter	\$469
E143 Ethernet	\$209
NE1000 Ethernet	\$139
NE2000	\$159
Ethercard +/-16	\$139/\$169
EtherLink II 3 Com	\$189
IBM Token Ring	\$599

VIDEO BOARDS

ATI VGA Wonder XL	\$179
ATI VGA Wonder 512	\$199
ATI 8514 1MG	\$489
Boca Super VGA	\$129
1024 VGA 16 Bit	\$79
NEC Grph Engine 256	\$849
Orchid Pro II 1MG	\$269
Paradise VGA 1024	\$139
Paradise +16	\$129

MONITORS

MITSUBISHI

EGA	\$319
VGA XC1429	\$389
Diamond Scan	\$489
HL6615 16"	\$1029
HL6945 20"	\$1789

NEC

3 FGX/4 FGX	\$639/\$769
Multisync IIID	\$549
Multisync IVD	\$979
Multisync VD	\$2099

PANASONIC

1381 VGA 1024x768	\$329
1395 VGA 1024x768	\$439
1991 VGA 1280x1024	\$1559

GOLDSTAR

Color/EGA	\$199/\$249
VGA 1425+/1430	\$259/\$279
VGA 1460	\$299
VGA 1620+	\$699

Arlington
Computer
Products, Inc.

1870 CARBOY
MT. PROSPECT, IL 60056

FOR CREDIT & BILLING ONLY
VISA
MasterCard
American Express

800-548-5105

CUSTOMER SERVICE AND INQUIRIES 708-228-6333

SHIPPING 708-228-9748

TECHNICAL ASSISTANCE 708-228-1470

We Export FAX 708-228-0516

No charge for Charge Cards

T E R M S O F P U R C H A S I N G

CIRCLE NO. 336 ON READER SERVICE CARD

LAPTOP COMPUTERS

AST Premium Exec 286/20/40MB	CALL
AST Premium Exec 386/40/80MB	CALL
AST Premium Exec 386/25/80MB	NEW
Compaq LTE386 30MB/60MB	CALL
Everex Tempo LX 20/40/60MB	CALL
Packard Bell PB386SX VGA/40MB	CALL
Panasonic CF270/370	1549/2719
Sharp PC6220 286 VGA 20MB	999
Texas Instruments TM2000	999
Texas Instruments TM3000	CALL
Texas Instruments 386-WINSX	NEW
Toshiba T2000SX 40MB	2269
Toshiba T2000SX 60MB	2949
Toshiba T2200SX 40MB/60MB	CALL
Toshiba T3000SX 120MB color	5799
Toshiba T5200 100MB	4199
Zenith ALL MODELS	CALL

COMPUTERS

AST Premium II 386SX/20 model 5	1319
AST Premium II 386/33 model 5	2399
Compaq Deskpro 386/20 w/80MB	CALL
Compaq Deskpro 386/20E w/124MB	CALL
Compaq SystemPro	ALL MODELS
DTK 286/386/486	custom quotes CALL
Packard Bell all models	CALL
Smith Corona	ALL MODELS CALL
Vide Terminals 30/50/80	294/375/298

DISK DRIVES

Conner 40MB IDE	199
Conner 105MB IDE	345
Conner 210MB IDE	529
Conner 510MB IDE	1229
Maxtor	ALL MODELS CALL
Pacific Rim External floppy drives	CALL
Plus Hardcard II XL 50MB	319
Plus Hardcard II XL 105MB	459
Seagate ST2511 40MB NFM	242
Seagate ST157A 45MB IDE	177
Seagate ST1144A 124MB IDE	379
Tec 3.5" and 5.25" floppies	CALL
Toshiba 1 2MB 1 44MB	69

MATH CO-PROCESSORS

Cyrix 80387DX 20/25	179
Cyrix 80387DX-33	199
Intel 80287XL	85
Intel 80387SX-16	124
Intel 80387SX-20	134
Intel 80387DX-20/25/33	199
Wetek	ALL MODELS CALL

MEMORY PRODUCTS

2MB for TI000SE/XE & T2000SX	269
2MB for T1 TM3000	249
1MB for Panasonic laser printers	CALL
1MB for Texas Instrmt laser printers	CALL
256Kx 80ns DRAM	5.50
256Kx 80ns SIMM	17.00
1MBx9 80ns SIMM	CALL
4MBx9 80ns SIMM	CALL

MICE

Logitech Duxa 2-button serial	49
Logitech Mouseman	79
Microsoft bus or serial 400 dpi	89
Microsoft mouse w/windows 3.0	149
Microsoft Ball Point mouse	125

MIDWEST COMPUTER WORKS

QUALITY SERVICE & GUARANTEED LOWEST PRICING!

PRINTERS

PANASONIC

KXP1180	149
KXP1123	199
KXP1124	275
KXP1624	339
KXP1654	535
KXP2624	375
KXP4420 Laser	SUPER
KXP4450 Laser	LOW
KXP4455 Laser	PRICES

NEC

P3200/P3300	269/379
P6200	487
P6300	625
P9300	1549
LC900 Postscript	CALL
ColorMate Postscript	4499

DICOMIX by Kodak

150	329
150+ carrying case	29
180s	299
Color4 inkjet	999

OKIDATA

182 Turbo	225
320-321	314.438
390+	439
391+	595
393+ Color	999
Laser 400	595
Laser 800	925
Laser 830	1312
Laser 840	1594

HEWLETT PACKARD

Deskjet 500	425
Laserjet IIP+	NEW
Laserjet IIP	1049
Laserjet III	1549
Laserjet IIID	2499
Laserjet IIISi	SPECIAL
Paintjet	699
Paintjet XL	1699
Scanjet	IN-STOCK
Scanjet 2C	NEW

CANON

BJ10EX Bubblejet	329
BJ10EX carrying case	29
BJ300	459
BJ330	599

STAR

NX1001	149
NX1020R Color	189
NX2420R Color	309
XB2415 Color	509
LaserPrinter 4	639
LaserPrinter 4	859

QUME

Crystal Express	CALL
-----------------	------

SEIKOSHA

SP 2000	165
LT 20-SL 90+	299/319

CITIZEN

GSX-140+145	299/399
PN48 notebook	299

QMS

410 Postscript	SPECIAL
810 Postscript	2749
815/815MR	2869/3905
825/825MR	3359/4625
Colorscrip 100	5875

TEXAS INSTRUMENTS

MicroLaser Basic	899
MicroLaser Basic XL	2149
MicroLaser PS17+	1199
MicroLaser PS35+	1499
MicroLaser XL PS17	2489
MicroLaser XL PS35	2799

EPSON

FX-850	CALL
LO-570	CALL
LO-870	CALL
EPX-7000	CALL
DFX-5000	1389
DFX-8000	2229

SEIKO

Smart Label Printer	174
---------------------	-----

LASERJET ACC.

HP Paper Cassette Trays	IN-STOCK
Pacific Data 25-in-1 cartridge	257
Pacific Data memory boards	CALL
Pacific Data Pacific Page XL	CALL
Pacific Data Postscript cart HP III/III	339

BATTERY BACKUPS

American Power AP400 desktop	179
American Power AP400 simline	305
American Power AP600 simline	435
American Power AP900 simline	609
American Power Surge Arrest Plus	39
Tripp Lite BC500	259
Tripp Lite BC750	429
Tripp Lite Iso Bar 4	44

MODEMS

Cardinal 2400 baud int MNP-5	99
Calpak 2496 send/rcv fax/modem	139
Intel Satisfaction Board	IN-STOCK
Intel 9600E external	489
Megahertz modems for all laptops	CALL
Prachba Peripherals 9600SA	489
US Robotics Courier 2400 MNP/5	279
Worldport Fax/Modems for laptops	CALL
Zoom V.42 bis winip external	139

CD-ROM DRIVES

NEC CDR 36 portable	366
NEC CDR 73 external	599
Toshiba TXM-3301	489
Sony CDD 535 internal	549
Sony CDD 7205 Laser Lib.	CALL

SOFTWARE

Adobe Type Manager	59
Adobe Type Manager Plus	119
Adobe Illustrator	305
Adobe Streamline	119
Aldus PageMaker 4.0	489
Bitstream Facelit/Value Pk.	119
Borland Quattro Pro	304
Caere Omnipage	449
Calera WordScan Plus	649
Corel Draw 2.0	359
Lotus 1-2-3 ver 3.1	399
Microsoft Excel 3.0	299
Microsoft Office for Windows	489
Microsoft PowerPoint	299
Microsoft Windows 3.0	99
Microsoft Word for Windows	299
Symantec Norton Desktop	95
Word Perfect 5.1	249

OVER 1000 TITLES IN STOCK!

PLOTTERS & DIGITIZERS

Calcomp 12x12 12x18	299/599
Hewlett Packard HP7440	CALL
Kurta 12x12 IS/one 12x17 IS/one	359/598
Summagraphics 12x12/12x18	329/599

TAPE BACKUP

Colorado DJ 10 40-120MB int	239
Colorado DJ-20 120-250MB int	295
Colorado OFA 700 250 700MB int	719
Inwin A120PC 40-120MB int	249
Inwin 80SX 80-250MB int	235
Maynard LI5540 40MB	249
Maynard VP150i	869
Mountain 40MB int/ext	249/CALL
Mountain FS8000 int	519

MISC

Soundblaster Pro	199
Keyboards XT/AT	69
Printer stands (all dot matrix)	9.95

SCANNERS

Complete PC page scanner & Wordscan	559
Hewlett Packard Scanjet, 2C color	CALL
Intel Satisfaction board scanner	279
Logitech Scanman 256	299
Microtek Scanmaker 600G	1029
Microtek Scanmaker 600Z	1329

MONITORS

Goldstar 1480- 14" 1024x768 28mm	319
Idek MF5117 17" 1024x768	CALL
Idek MF5217 17" 1280x1024 26mm	CALL
Mitsubishi HL6605 16" 1024x768	989
Mitsubishi HL6945 20" 1024x768	1785
Nanaco 9070U 16" 1024x768 28mm	1019
Nanaco 9080U 16" 1280x1024	1199
NEC IIA 14" VGA 800x600	429
NEC 3DS 14" multisync 1024x768	569
NEC 4DS 16" multisync 1024x768	CALL
NEC 5D 20" multisync 1280x1024	2179
NEC 3FG 15" 1024x768 28mm	NEW
NEC 5FG 17" 1280x1024 28mm	NEW
NEC 8FG 21" 1280x1024 28mm	NEW
Packard Bell 8528SV 14" 1024x768	329
Panasonic 13811 14" 1024x768	339
Phonotek Ultra-1200 Ultra-1400	CALL
Samsung ML 4571 14" mono VGA	139
Samsung Syncra 17" 1024x768	STOCK
Seiko 1440/1450 14" VGA 25mm	495/635
Seiko CM2050 20" 1024x768 31mm	1919
Sony CDP1304 14" 1024x768 25mm	579
Sony CDP1604S 17" 1024x768 25mm	NEW
Zenith 1492 14" flat lenson VGA	592

VIDEO DECKS

ATI VGA Wonder XL w/mouse 256K	179
ATI VGA Wonder XL w/mouse 512K	197
ATI VGA Wonder XL w/mouse 1MB	255
ATI 8514 Ultra 512K 1MB	395/485
ATI Vantage 512K 1MB	CALL
ATI Graphics Ultra w/mouse	CALL
Boca SVGA 1024x768 512K 1MB	129/149
Cardinal-700 1024x768 512K 1MB	138/159
Hercules Graphics Station 1M/3M	529/679
NEC Graphics Engine 16/256	595/689
Orchid Pro Design II 512K 1MB	CALL
Paradise 8514/A+	469
Video 7 1024x256K/512K	129/149

NETWORKING

3COM 3C503 Etherlink	189
Digiboard	ALL MODELS CALL
Lanstar Ethernet Starter Kit	469
Netware 2.2 5-user	482
Netware 2.2 50-user	1945
Netware 3.1 10-user	1369
Netware 3.1 20-user	1899
Netware 3.1 100-user	3799
Netware 3.1 250-user	6999
Netware Lite (peer to peer)	NEW
NE1000/NE2000 Boards	135/159
SMC Arcnet PC130/270E	98/124
SMC Arcnet PC500WS/PC500FS	179/239
Tarc 0111 0105	89
Thomas Conrad 6242 Arcnet 8-bit	209
Thomas Conrad 6245 Arcnet 16-bit	209
Western Digital Elite/Elite 16	145/179
Xircor pocket lan adapters	CALL

FAX MACHINES

Canon Faxphone 24	769
Panasonic Faxline UF127	589
Panasonic UF300 plain paper	1499
Panasonic UF750 Laser FAX	2699
Sharp F2040	659
Sharp F0334	749

WIDE SELECTION
Huge inventory. Thousands of items in stock and ready for immediate shipment!

ON-TIME
In-stock orders are shipped the same day. We are fast & efficient.

RELIABILITY
We earn your business! Over 70% of our orders are repeat customers.

KNOWLEDGABLE
All of our salespeople are technically trained to provide you with the right solution!

SERVICE
If you don't find it, ask. Our friendly staff will special order products for you!

SMITH CORONA Acer
386SX/20 80MB
•386SX 20MHz/2MB RAM
•3.5" & 5.25" floppies
•60mb 17ms hard drive
•2 serial, 1 parallel ports
•MS DOS 5.0 Pre-installed
•FREE Microsoft Works
•FREE Logitech mouse
•1-year on-site warranty
\$1099

SMITH CORONA Acer
386SX/20 120MB
•386SX 20MHz/2MB RAM
•3.5" & 5.25" floppies
•120mb 17ms hard drive
•MS DOS 5.0 Pre-installed
•FREE FAX Modem
•FREE Microsoft Windows 3.0
•FREE Microsoft Works
•FREE mouse & Prodigy
•1-year on-site warranty
\$1299

AST RESEARCH INC.
PREMIUM EXEC 386SX/20
•386SX 20MHz/2MB RAM
•Expandable to 16MB RAM
•1 44MB built-in floppy
•40MB HD (80 & 80MB opt)
•VGA paper-white display
•1-ser, 1-par VGA or mouse or keyboard ports
•8.5 lb. 9"D x 11" W x 2.2"H
NEW LOW PRICE

TEXAS INSTRUMENTS
TM3000
•386SX 20MHz/2MB RAM
•Expandable to 6MB RAM
•1 44MB built-in floppy
•20MB HD (30, 40 & 80MB opt)
•VGA paper-white display
•1-ser, 1-par, VGA, mouse & numeric keypad ports
•5.7 lb. 8.5"D x 11" W x 1.8"H
\$2139

SONY
CD-ROM / LASER LIBRARY
•External CD-ROM drive system
•Software includes:
•Compton's Encyclopedia
•World Atlas, Net Geographic Mammals, Language of the World and much more
NOW IN STOCK!

Panasonic
Office Automation
KXP-1124
24-PIN DOT MATRIX PRINTER
•New EZ set LCD operator panel
•300cps draft print speed w/2K buffer
•Front, rear, top or bottom paper feed
•Push and pull tractor
•Auto paper parking & loading feature
•Emulates Epson & IBM
•2-year Panasonic Warranty

Panasonic
Office Automation
KXP-1654
24-PIN WIDE CARRIAGE PRINTER
•New EZ set LCD operator panel
•Fast 375cps draft print speed w/42K buffer
•Front, rear, top or bottom paper feed
•Push and pull tractor
•Auto paper parking & loading feature
•Emulates Epson & IBM
•2-year Panasonic Warranty

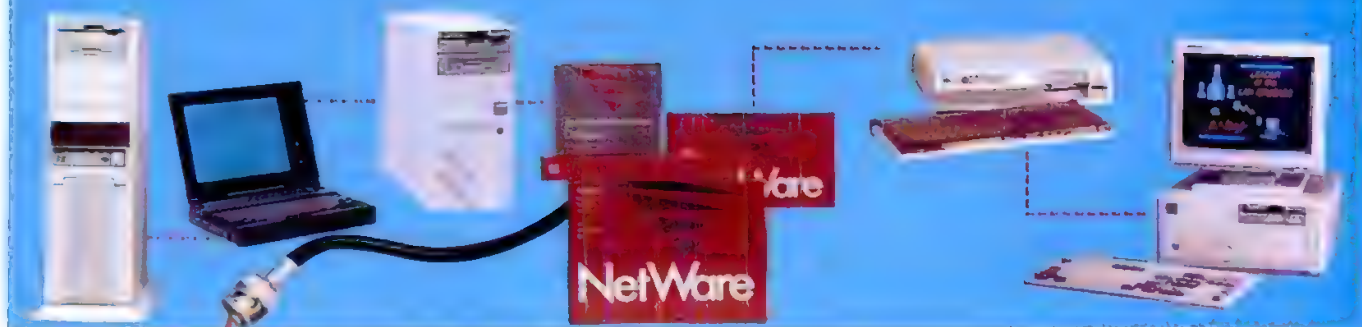
Panasonic
Office Automation
CF-370
NOTEBOOK LAPTOP COMPUTER
•80386SX 20MHz w/1MB RAM (max 5MB)
•Cnsp 840x480 VGA LCD display
•1 44MB built-in floppy
•Fast 60MB hard disk drive
•3-hour rechargeable battery
•12.2" x 10" x 1.73" dimensions
•Only 6.9 lbs w/battery (110-240V 50-60Hz)

Panasonic
Office Automation
KXP-4420
PERSONAL LASER PRINTER
•8 pages per minute
•One 250 sheet tray
•300 dpi resolution
•512K RAM (max 4 SMB)
•HP emulation
•22 internal fonts
•1-year warranty

Panasonic
Office Automation
KXP-4450i
LASER PRINTER
•Fast 11 pages/min at 300 dpi
•Two 250 sheet trays
•Individual sheet loading
•512K RAM (max 4 SMB)
•HP & Epson emulation
•28 internal fonts
•1-year warranty

MIDWEST COMPUTER WORKS
IL 60089

DIRECT ORDER LINE
800-669-5208
TECH SUPPORT & CUSTOMER SERVICE 708-459-6883 • FAX 708-459-6933
WE GUARANTEE THE LOWEST PRICES AND THE BEST SERVICE!
CIRCLE 489 ON READER SERVICE CARD



LANtek Makes Networking Simple As 1.2.3.

Experience and Expertise

Whether you are creating your first network or are enhancing an existing one, LANtek is the place to call. Our experience with Local and Wide Area Networks spans over 6 years. We can design and custom configure the Network that will serve your business today - with an eye towards growth in the future.

Factory-Direct

When you buy from LANtek, you are buying factory-direct, so there's no middleman. You get the quality, reliability, and features you want, at a substantial saving.

Plug and Play

Our LANs come pre-configured the way you wanted. All you have to do is connect the cable and you have got a LAN that is ready to fly.

Services and Support

Our service to you doesn't stop at delivery. LANtek provides on-line modem support from our staff of knowledgeable CNE technicians. Or you can call our Emergency Customer Support Center and receive responsive, sophisticated on-line, or on-site network support.

Warranty and Guarantee

At LANtek we use only the best components, we proudly offer all products with an unbeatable life time warranty on labor. All LANtek Token Ring and Ethernet networking interface card carry life time warranty on parts also. The rest carry 1 year on parts. We stand by our products with a 30 day money back guarantee.

Reliability and Quality:

Pull the cover off any LANtek file server or work station and look around. You will see names like Intel, Motorola, UltraStor, Conner, Micropolis, Teac, Novell, Western Digital, etc. on the system board, drives, and interface cards. We don't just build computers. We build value. Quality costs customers and us less in the long run. And we want to be your computer company for a long time to come.

**Complete 286-16 ARCnet
Diskless Workstation**

\$495.00

Standard Configuration:

- Intel Processor
- 1 MB 80ns or Faster RAM memory
- Expandable to 16/64 MB of system RAM
- DFI 2 serial, 1 parallel, 1 game port
- Teac 1.2M or 1.4M floppy disk drive
- Math Co-processor socket
- Focus 2001 101-key enhanced keyboard
- DFI IDE dual floppy and hard drive controller
- 200+W CSA, UL, TUV approved power supply
- Samsung Amber Monitor and card

SYSTEM PRICE CHART

MONO VGA ADD \$100, SVGA ADD \$335

LANtek	Conner			Micropolis 5 yr Warranty	
	40MB	120MB	200MB	345MB	650MB
486-33	\$1,619	\$1,823	\$2,079	\$2,735	\$3,108
486-SX	\$1,417	\$1,621	\$1,877	\$2,533	\$2,907
386-40	\$1,231	\$1,435	\$1,691	\$2,347	\$2,720
386-25	\$1,008	\$1,212	\$1,468	\$2,124	\$2,497
386-SX	\$892	\$1,096	\$1,352	\$2,008	\$2,381

NETWORKING

Novell NetWare	\$ Call
Artisoft LANtastic NOS	\$ 75
Novell Certified ARCnet 8 bit card	\$ 65
Novell Certified ARCnet 16 bit card	\$ 95
LANtek ARCnet Pocket Adaptor	\$ 195
Thomas Conrad 100Mbps ARCnet Card	\$1095
LANtek ARCnet 8 Port Active Hub	\$ 175
LANtek ARCnet Passive Hub	\$ 29
Novell Certified Ethernet 8 bit Card	\$ 119
Novell Certified Ethernet 16 bit Card	\$ 149
Western Digital EtherCard Plus 16 bit	\$ 179
LANtek Ethernet Pocket Adaptor	\$ 245
LANtek Ethernet 16 bit 10base T Card	\$ 179

LANtek Ethernet 8 bit 10base T Card	\$ 149
LANtek 12 port 10base T Concentrator	\$ 695
LANtek 8 port 10base T Concentrator	\$ 495
SynOptics 504-st Fiber Optic Transceiver	\$ 495
3Com 3C503 EtherLink II Card	\$ 225
Proton Token Ring products	\$ Call
LANtek 16 bit 16/4 Mbps Token Ring	\$ 395
LANtek Token Ring 8 Port MAU	\$ 395
American Power 520VA (360W) UPS	\$ 365
American Power UPS Monitor Card Cable	\$ 85
Colorado 250MB Tape Backup Drive	\$ 325
LAN Modem Sharing Software	\$ 295
LAN 9600 Fax Sharing Hardware & Software	\$ 895

**TESTED AND
APPROVED**
NetWare Compatible
Contact the vendor of this product for
configurations, tested and approved
122 East 1790 South, Provo, Utah 84601



NOVELL
Gold
Authorized
Dealer

We're Novell Gold Authorized Dealer, all of our computer systems are 100% compatible with Novell 3.0, XENIX and etc. Our technical staff can help you plan and equip your network system, including all necessary hardware and software.

TO ORDER CALL: 1 (800) 462-0436

• **Technical Support/General Information:**
(714) 594-9491

• **Fax Order: (714) 594-6490**

• **SALES HOURS:** Mon thru Fri: 8 a.m. to 6 p.m.

• Pricing is subject to change without notice.

LANtek Computer, Inc.

661 Brea Canyon Road, Ste #3, Walnut, CA 91789

• **30 Day Money Back Guarantee**
(Excluding shipping & software)

• We accept VISA, MasterCard, COD or Purchase Order with approved credit.

• Corporate, Government, and Dealer Accounts Welcome.

All systems are fully compatible with MS-DOS, OS/2, NOVELL, XENIX, and Pick. NetWare are sold in California. All companies and product names are trademarks of their respective companies.



JDR Microdevices

2233 Samaritan Drive, San Jose, CA 95124

Serving you since 1979

BUY WITH CONFIDENCE FROM JDR!

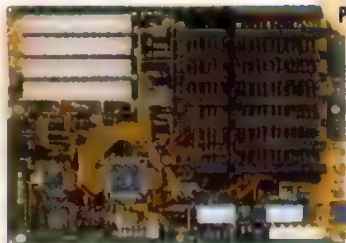
• 30-DAY MONEY BACK GUARANTEE

• 1 YEAR WARRANTY

• TOLL-FREE TECH SUPPORT

MMC

MOTHERBOARDS



NEW
LOWER
PRICES

16MHz MINI 386-SX \$299⁹⁵

• NORTON SI 15.3 • LANDMARK AT SPEED 20.8

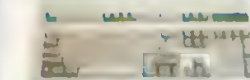
• EXPANDABLE TO 8MB ON BOARD • AMI BIOS • FIVE 16 BIT AND THREE 8 BIT SLOTS • CHIPS & TECHNOLOGY NEAT CHIPSET • SOCKET FOR 80387 SX CO-PROCESSOR • 8.5" X 13" SIZE FITS MINI-286 AND FULL-SIZE 286 CASES

MCT-386SX		\$299.95
MCT-386SX-20	20MHz MINI 386 SX	\$349.95
MCT-386-25	25MHz MINI 386	\$499.95
MCT-C386-33	MINI-SIZE 33MHz CACHE 386	\$699.00
MCT-C386-40	MINI-SIZE 40MHz CACHE 386	\$699.00
MCT-M486-33	MINI-33MHz CACHE 486	\$1295.00
MCT-M286-16	MINI-16MHz 286	\$199.95
MCT-M286-12	MINI-12MHz 286	\$179.95

POWER SUPPLIES

• UL APPROVED • 110/220V.50/60HZ

PS-135	8088 135 WATT	\$59.95
PS-150	8088 150 WATT	\$69.95
PS-200X	8088 200 WATT	\$89.95
PS-200	286/386/486 200 WATT	\$89.95
PS-250	286/386/486 250 WATT	\$129.95



101-KEY
\$49⁹⁵

BTC-5339		\$49.95
FC-3001	101 KEY 12 F KEYS & CALCULATOR	\$69.95
BTC-5060	84-KEY WITH 10 FUNCTION KEYS	\$59.95

DYNAMIC RAM

PART #	SIZE	SPEED	TYPE
TMS4464-12	655kx4	120ns	DIP
41256-100	262144x1	100ns	DIP
41256-80	262144x1	80ns	DIP
41256-60	262144x1	60ns	DIP
414256-100	262144x4	100ns	DIP
414256-80	262144x4	80ns	DIP
1MB-100	1048576x1	100ns	DIP
1MB-80	1048576x1	80ns	DIP
1MB-60	1048576x1	60ns	DIP
41256A9B-80	256K x 9	80ns	SIMM
41256A9B-60	256K x 9	60ns	SIMM
256KX9SIP-80	256K x 9	80ns	SIP
421000A9B-80	1MB x 9	80ns	SIMM
421000A9B-60	1MB x 9	60ns	SIMM
1MBX9SIP-80	1MB x 9	80ns	SIP
424000A9B-80	4MB x 9	80ns	SIMM

MATH CO-PROCESSORS

MANUAL, SOFTWARE GUIDE & 5 YEAR WARRANTY

PART #	SPEED	PRICE	PART #	SPEED	PRICE
8087	5 MHz	89.95	80287-XLT	12 MHz	84.95
8087-2	8 MHz	129.95	80387-DXP	33 MHz	209.95
8087-1	10 MHz	129.95	80387-SX	33 MHz	129.95
80287-XL	12 MHz	84.95	80387-SX20	20 MHz	149.95
83D87-16	16 MHz	199.95	83D87-40	40 MHz	239.95
83D87-20	20 MHz	209.95	83S87-16(SX)	16 MHz	129.95
83D87-25	25 MHz	219.95	83S87-20(SX)	20 MHz	149.95
83D87-33	33 MHz	229.95	83S87-25(SX)	25 MHz	159.95
2C87-8	8 MHz	79.95	2C87-12	12 MHz	89.95
2C87-10	10 MHz	89.95	2C87-20	20 MHz	139.95

MAXIMIZE CO-PROCESSOR SPEED

OUR "2ND STAGE" ALLOWS 10 & 20MHz CO-PROCESSORS TO RUN AT FULL SPEED IN THE SLOWEST 286 SYSTEMS

2ND-STAGE FOR 10.20 MHz 80287S \$29.95

INTERFACE CARDS

16-BIT IDE MULTI I/O

\$69⁹⁵

• 286/386/486 COMPATIBLE
• SUPPORTS 2 IDE HARD & 2 FLOPPY DRIVES
• TWO SERIAL, ONE PARALLEL & ONE GAME PORT

MCT-IDEIO		\$69.95
MCT-IDEFH	IDE HARD FLOPPY CARD	\$29.95
MCT-IO	MULTI I/O CARD FOR 8088 SYSTEMS	\$59.95
MCT-AIO	286/386/486 MULTI I/O CARD	\$49.95
MCT-EEMS	16-BIT EEMS CARD	\$149.95
SIMPLY-RAM	8MB SIMM MEMORY CARD (OK)	\$199.95

1.44MB FLOPPY \$49⁹⁵

• 8088 OR 286/386/486 COMPATIBLE
• SUPPORTS 2 FLOPPY DRIVES (360K, 720K, 1.2MB & 1.44MB)
• USER SELECTABLE AS PRIMARY OR SECONDARY, 3RD OR 4TH FLOPPY DRIVE

MCT-FDC-HD		\$49.95
MCT-FDC-HD4	4 FLOPPY VERSION	\$59.95

3-BUTTON MOUSE

\$14⁹⁵

• ACCURACY 290-1450 DPI
• MICROSOFT & MOUSE SYSTEMS COMPATIBILITY MODE
• OPTO-MECHANICAL DESIGN
• WINDOWS 3.0 COMPATIBLE

JDR-MOUSE-3		\$14.95
-------------	--	---------

UPRIGHT CASE

\$99⁹⁵

• FOR STANDARD FULL SIZE AND MINI MOTHERBOARDS
• MOUNTS FOR 3 FLOPPY AND 4 HARD DRIVES
• TURBO AND RESET SWITCHES
• SPEED DISPLAY, POWER DISK LEDS
• CASE-100A \$99.95
• CASE-200A HOLDS 11 DRIVES \$349.95
• PS-250TW 250 WATT P.S. \$129.95
• PS-300TW 300 WATT P.S. \$149.95
• POWER SUPPLIES ARE UL APPROVED

MORE CASES...

CASE-70	FULL SIZE 286 STYLE CASE	\$89.95
CASE-50	MINI SIZE 286 STYLE CASE	\$59.95

UNIVERSAL PROGRAMMER/TESTER

• PROGRAMS EPROMS, EEPROMS, PALs, BI POLAR PROMS, 8748 & 8751 SERIES, 16V8 & 20V8 GALs • TESTS TTL CMOS DYNAMIC & STATIC RAMS

MOD-MUP REQUIRES HOST ADAPTOR CARD ... \$499.95

EPROM PROGRAMMING MODULES

• PROGRAMS 24 32 PIN EPROMS, CMOS EPROMS & EEPROMS 16K TO 1024K • HEX TO OBJ CONVERTER

MOD-MEP	REQUIRES HOST ADAPTOR CARD	\$119.95
MOD-MEP-4	4-EPROM UNIT	\$169.95
MOD-MAC	COMMON HOST ADAPTOR CARD	\$29.95

BREADBOARD ON-A-CARD

• ADDRESS DECODING LOGIC, DATA BUFFERING, & LOGIC CIRCUITS FOR PROGRAMMABLE DIGITAL I/O & COUNTER TIMING FUNCTIONS • ACCEPTS UP TO 24 14 PIN IC'S

PDS-601	8 BIT CARD	\$79.95
PDS-611	16-BIT CARD WITH LO DECODE	\$89.95

PROTOTYPE CARDS

WITH SILK-SCREENED LEGENDS

JDR-PR2	8 BIT WITH I/O DECODE LAYOUT	\$29.95
JDR-PR10	16-BIT WITH I/O DECODE LAYOUT	\$34.95

CALL FOR OUR FREE CATALOG TODAY!

FOR PC'S, MONITORS, DISK DRIVES, KEYBOARDS, MODEMS, CABLES, CONNECTORS, SOFTWARE, ICS, PROGRAMMING PRODUCTS, TEST EQUIPMENT, COMPONENTS & MORE!



8/16 BIT VGA CARD \$49⁹⁵

• 8/16 BIT 8088 & 286/386/486 COMPATIBLE
• 800 X 600 IN 16 COLORS
• 640 X 480 IN 16 COLORS
• 320 X 200 IN 256 COLORS
• 256K VIDEO RAM

MCT-VGA-16		\$49.95
MCT-VGA-1024+	1024 X 768/256 COLORS	\$149.95

1024 x 768 \$499⁹⁵

VGA PACKAGE

• 8088 & 286/386/486 COMPATIBLE CARD & 1024 X 768 INTERLACED MONITOR

VGA-PKG-1024+		\$499.95
VGA-PKG	640 X 480 VGA PACKAGE	\$369.95
VGA-MON-1024N	NON-INTERLACED MONITOR	\$479.95

POST CODE DISPLAY CARD \$49⁹⁵

READ DISPLAY AND CHECK MANUAL FOR POWER ON SELF TEST CODE

• 286/386/486 COMPATIBLE
• WORKS WHEN SOFTWARE WON'T EVEN BOOT YOUR PC
PCODE \$49.95

9600 BAUD V.42 BIS MODEM \$399⁹⁵

• COIT V.42BIS V.32 V.22B/S BELL 212A AND HAYES AT COMMAND SET COMPATIBLE
• 2 YEAR PROMETHEUS WARRANTY

PRO-96E		\$399.95
---------	--	----------

2400 BAUD MODEM

\$49⁹⁵

• 2400/1200/300 BPS INTERNAL DATA MODEM • FULL HAYES AT COMPATIBILITY • INCLUDES PROCOMM SOFTWARE

MCT-241		\$49.95
MCT-FAXM	AS ABOVE W/4800 BPS FAX SEND	\$89.95

HARD DRIVES 45MB \$199

IDE 3-1/2"	ST-125A	21.5MB	28MS	\$179
IDE 3-1/2"	ST-138A	32.1MB	28MS	\$189
IDE 3-1/2"	ST-157A	44.7MB	28MS	\$199
IDE 3-1/2"	ST-1102A	89.1MB	19MS	\$359
IDE 3-1/2"	ST-1144A	131MB	19MS	\$459
IDE 3-1/2"	ST-1201A	177MB	15MS	\$699
IDE 5-1/4"	ST-2274A	241MB	16MS	\$1195
IDE 5-1/4"	ST-3281A	338MB	16MS	\$1295
IDE 3-1/2"	ST-1480A	426MB	14MS	\$1595
MFEM 5-1/4"	ST-225	21.4MB	65MS	\$199
MFEM 3-1/2"	ST-125	21.4MB	28MS	\$229
MFEM 3-1/2"	ST-138-1	32.1MB	28MS	\$259
MFEM 5-1/4"	ST-251-1	42.8MB	28MS	\$249
MFEM 5-1/4"	ST-4096	80.2MB	28MS	\$569
RL 5-1/4"	ST-228	32.7MB	65MS	\$219
RL 3-1/2"	ST-138R	32.1MB	28MS	\$249
RL 5-1/4"	ST-277-1	65.5MB	28MS	\$289
SCSI 5-1/4"	ST-228H	84.9MB	28MS	\$369
SCSI 3-1/2"	ST-1058H	83.9MB	20MS	\$499

FLOPPY DRIVES

FDD-1.44X	1.44MB 3.5" FLOPPY BLACK	\$79.95
FDD-1.44A	1.44MB 3.5" FLOPPY BEIGE	\$79.95
FDD-1.2	5.25" DOUBLE-SIDED HD 1.2MB	\$89.95
FDD-55GFV	5.25" TEAC DOUBLE-SIDED HD 1.2MB	\$99.95
FDD-360	5.25" DOUBLE-SIDED DD 360K	\$69.95
FDD-55B	5.25" TEAC DOUBLE-SIDED DD 360K	\$89.95



SALES 800-538-5000

Customer Service 800-538-5001 Local/Int'l 408-559-1260
Technical Support 800-538-5002 Fax 408-559-0250

©1991 JDR Microdevices, Inc. All rights reserved. JDR, the JDR logo, JDR Microdevices, and the JDR logo are registered trademarks of JDR Microdevices, Inc. Modular Circuit Technology is a trademark of JDR Microdevices, Inc. Copyright 1991 JDR Microdevices

KEY CODE 1117

CIRCLE 127 ON READER SERVICE CARD



For the best memor...

For the best memories:

HOLIDAY WINDOW SPECIALS 

**TOLL
FREE
ORDER
LINE**

18002558607

		NEC		2558607	
306S		Powermate SX PLUS			
Module	99	1-2 MB	189		
Module		Exp Bd			
Module	229	APC-H850E			
4001		1 MB	139		
4001	139	Module			
4001		APC-H851E			
4001	299	4 MB	599		
4001		Exp Bd			
306/20		APC-H852E			
4001	149	4 MB	649		
4001		Module			
ACE BD	89	Av. Model			
4001		Powermate 306/20			
4001	399	386SX, Businessmate			
4001		Module 306/25			
4001	399	2 MB	419		
4001		Module			
4001		APC-H855X			
4001		Powermate 406/33E			
4001		486/25E			
4001		Businessmate			
4001		306/33 400/25E			
4001		Module	289		
4001		APC-H856			
4001		OP-41 501			
4001		Call Sam			

NBCC NOTEBOOK SX20 ★ \$2595.00 ★ 40MB HD ★ 4MB MEMORY
619-931-7824 (Technical Support) ★ FAX 619-931-6557

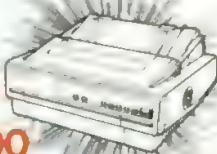
**Please write to:
PC Magazine, P.O.
Box 54093, Boulder,
CO 80322. Include
your mailing label
from a recent issue
of PC Magazine
for faster service.
Please allow up to
60 days for change
of address to take
place.**

[illegible]

COMPUTER DISCOUNT WAREHOUSE

EPSON LQ-570, LQ-1070

✓ 24-Pin Dot Matrix Printer, Narrow (LQ-570): Wide (LQ-1070) ✓ Includes Two Scalable Fonts, 8 to 32 Points ✓ 12 Built-In Fonts ✓ Top, Rear, Bottom and Front Paper Paths ✓ Fast Print Speeds Up to 315 CPS ✓ Epson's Two Year Limited Warranty



LQ-570... **\$257.00**
LQ-1070... **\$349.00**

EPSON

WHY PAY RETAIL?

CDWTM Sells For Less

AND SERVICES YOU BETTER

EPSON ACTION LASER II

✓ 6 PPM ✓ HP IIP, Epson FX NLQ Emulation ✓ 14 Std. Fonts ✓ 512 K Std., Exp. to 5.5 With 0 K Memory Board ✓ Font Cartridge Slot ✓ Comes Std. With: Toner Cartridge, Photo-conductor Unit and Letter Paper Cassette Tray ✓ Two Year Limited Warranty



EPSON Action Laser II

CDW Price
\$687.00

CDWTM MAKES TECHNOLOGY WORK FOR YOU!

EPSON EPL-7000

Laser Printer

✓ 8 PPM ✓ Two-Channel Printer Sharing Capability ✓ 512 KB RAM Std., Exp. to 2 MB ✓ MicroArt Printing With 300 DPI Res ✓ 14 Resident Fonts ✓ HP LaserJet IIP Compatibility ✓ Epson FX/LQ Emulation ✓ Fully-Upgradeable to EPL 7500 ✓ Two Year Limited Warranty



EPL-7000

CDW Price

\$789.00

EPSON EPL-7500 Laser Printer

✓ True Adobe[®] Postscript[®] ✓ High-Speed RISC Processor ✓ Parallel, Serial and AppleTalk[®] Interfaces Std. ✓ HP LaserJet Series II Emulation ✓ 6 PPM ✓ 35 Resident Fonts ✓ 2 MB RAM Std., Exp. to 6 MB ✓ MicroArt Printing With 300 DPI ✓ 250-Sheet Paper Tray Std. ✓ Two Year Limited Warranty

CDW Price...

\$1899.00

EPSON

LQ 2550

EPSON LQ-2550

✓ 324 CPS in Draft Mode ✓ 405 CPS in Ultra High-Speed Mode ✓ Color Capability ✓ 106 CPS in NLQ Mode ✓ 8K Buffer ✓ 5 Letter Quality Fonts ✓ Front Panel Controls

CDW Price

\$859.00

EPSON LQ-870, LQ-1170

✓ Includes Two Scalable Fonts, 8 to 32 Points ✓ 12 Built-In Fonts ✓ Top, Rear, Bottom and Front Paper Paths ✓ Fast Print Speeds Up to 413 CPS ✓ Epson's Two Year Limited Warranty

LQ-870... **\$435.00** LQ-1170... **\$584.00**

EPSON LX-810

✓ 240 CPS in Draft Mode, 30 CPS in NLQ Mode ✓ 9-Pin Printer ✓ 8K Buffer ✓ 80 Column Printer ✓ Friction and Tractor Feed ✓ IBM ProPrinter Character Set ✓ Two Year Limited Warranty

CDW Price

\$154.00

EPSON FX-850, FX-1050

✓ 264 CPS in Draft Elite Mode ✓ 54 CPS in NLQ ✓ 8K Buffer ✓ Friction and Tractor Feed ✓ Automatic Single-Sheet Loading ✓ Two Year Limited Warranty

FX-850... **\$289.00** FX-1050... **\$395.00**

HAYES OPTIMA 96/V.32

✓ Automatically Selects The Highest Speed and The Best Combination of Error- Control and Data Compression Every Time it Connects With Another Modem ✓ Automatic Feature Negotiation, Auto Speed Buffering, and Hayes Standard AT Command Set ✓ Protects Your Data With the Most Popular Error-Control Technologies and Provides Optimum Communications Flexibility ✓ Asynchronous and Synchronous ✓ MNP 5 Error Control ✓ CCITT V.42 International Error Control ✓ Includes Free Smartcom EZ[®] Software ✓ Also Available: Info Services, FAX Delivery Services, and Data Communications Library

CDW Price... **\$434.50**

Hayes

Hayes

Hayes



Pocket Edition 2400

✓ Line Powered, No Need For Batteries ✓ Compact Size (3 Inches Long and Only 3 Ounces) Makes This Modem Ideal For Your Laptop Computing Communications ✓ Includes Smartcom EZ Communications Software, Cables and Carrying Case

CDW Price... **\$112.92**

Hayes ULTRA 96

✓ Provides Synchronous/ Asynchronous Communication ✓ Compatible With Full Range of Modulation Standards ✓ Supported Data Compressions ✓ Compliance With CCITT 9600, 4800, 2400, 1200/75, 1200, and 300 bps Standards ✓ Operates On Dial-Up or Leased Line ✓ Automatic Feature Negotiation Allows ULTRA 96 to Establish the Most Efficient Communication Session Based Upon the Equipment at the Other End of the Line



CDW Price
\$609.98

Hayes

HAYES Smartmodem 2400 External... **\$323.84**

HAYES V-Series Smartmodem 9600 V.42/X.25 External ... **\$495.65**

HAYES V-Series Smartmodem 9600 V.42 Internal **\$469.13**

HAYES V-Series Smartmodem 2400 V.42 External..... **\$399.30**

AT CDWTM YOU GET MORE COMPUTING FOR YOUR BUCK. CALL NOW!

◆ CDW[®] means Service ◆ CDW[®] means Savings ◆ CDW[®] means Business ◆ CDW[®] means Experience
◆ CDW[®] means Technology ◆ CDW[®] means Networking ◆ CDW[®] means Computing

PCM334

**FREE TECHNICAL
SUPPORT FOR CDW[®]
CUSTOMERS**

(800) 326-4CDW

WE SELL NAME BRANDS FOR LESS!

1991 MPK Computing Inc.

**ALWAYS WORKING TO
KEEP YOUR COMPUTING
ONE STEP AHEAD**



A RECOGNIZED LEADER!

QUANTUM

52Mb QULPS52A (IDE)
17ms 3.5" 1"H
Bare Drive \$209
16 Bit Kit \$229

105Mb QULPS105A (IDE)
17ms 3.5" 1"H
Bare Drive \$349
16 Bit Kit \$389

210Mb QUPRO210A (IDE)
15ms 3.5" HH
Bare Drive \$649
16 Bit Kit \$669

Maxtor

80Mb MX7080A (IDE)
17ms 3.5" 1"H
(SCSI available)
Bare Drive
8 Bit Kit
16 Bit Kit

120Mb MX7120A (IDE)
15ms 3.5" 1"H
Bare Drive \$389
8 Bit Kit \$429
16 Bit Kit \$399

210Mb MX213A (IDE)
15ms 3.5" HH
(SCSI available)
Bare Drive \$599
8 Bit Kit \$629
16 Bit Kit \$629

340Mb MX8380E/S (ESDI SCSI)
14.5ms 5.25" FH
Bare Drive \$1199
16 Bit Kit \$1299

860Mb MX8760E/S (ESDI SCSI)
16ms 5.25" FH
Bare Drive \$1599
16 Bit Kit \$1699

HARD DRIVES AND PERIPHERALS

NEW LOWER PRICES



FOR THE BEST PRICE, SERVICE & SUPPORT CALL:

800/927-3167

HDI SALES: 800/927-3167
or 602/350-1128
FAX 602/350-1150

NATIONAL ACCOUNTS
Purchase Orders
800/927-9923
FAX 602/350-1180

International: 602/350-1144
FAX 602/350-1188

APO/FPO: 602/350-1145

Order Status: 800/729-4490

MICROPOLIS

HIGH CAPACITY
HIGH SPEED



340Mb MC1664 (ESDI)
15ms 5.25" HH
Bare Drive \$1099
16 Bit Kit \$1199

660Mb MC1568/1588 (ESDI SCSI)
16ms 5.25" FH
Bare Drive \$1499
16 Bit Kit \$1699

1034Mb HS MC1598 (SCSI)
14ms 5.25" FH
Bare Drive \$2199
16 Bit Kit \$2299

1354Mb HS MC1528 (SCSI)
14ms 5.25" FH
Bare Drive \$2699
16 Bit Kit \$2799

Seagate IMPRIMIS

40Mb ST157A (IDE)
28ms 3.5" HH
Bare Drive \$169
8 Bit Kit \$189
16 Bit Kit \$189

60Mb ST277R-1 (IDE)
28ms 5.25" HH
Bare Drive \$249
8 Bit Kit \$299
16 Bit Kit \$319

89Mb ST3096A (IDE)
16ms 3.5" 1"H
Bare Drive \$289
16 Bit Kit \$299

125Mb ST1144A (IDE)
19ms 3.5" HH
Bare Drive \$359
16 Bit Kit \$379

210Mb ST1239A (IDE)
15ms 3.5" HH
Bare Drive \$599
16 Bit Kit \$619

340Mb ST4376N (SCSI)
17.5ms 5.25" FH
Bare Drive \$1199
16 Bit Kit \$1349

660Mb ST4766E (ESDI)
15.5ms 5.25" FH
Bare Drive \$1599
16 Bit Kit \$1699

1 GIG!
1050Mb ST41200N (SCSI)
15ms 5.25" FH
Bare Drive \$2099
16 Bit Kit \$2249

ALL BARE DRIVES INCLUDE
All mounting hardware, "Disk Manager"
formatting/partitioning software (40Mb+),
and HDI's Hard Drive Balance Manual
with complete installation instructions.

COMPLETE INSTRUCTIONS

ALL KITS INCLUDE
16-Bit host adapter card/floppy "1 to 1"
controller or interface card, mounting
kit (3.5" kit inc. beige & black bezels),
rains, cables, all mounting hardware, "Disk
Manager" software (40Mb+), and manual.
EVERYTHING YOU NEED!

TAPE BACKUP



Insight

With data compression. Standard
QIC 80 attaches to existing floppy
controller or dedicated host 2 -
3Mb/min. backup.

120Mb/250Mb
Internal Unit \$259
External Unit \$399
Both inc. one 80Mb tape.
120Mb Tape \$29

CONNER

40Mb CP3000 (IDE)
25ms 3.5" 1"H
Bare Drive \$189
8 Bit Kit \$219
16 Bit Kit \$199

120Mb CP30104 (IDE)
16ms 3.5" 1"H
Bare Drive \$379
8 Bit Kit \$419
16 Bit Kit \$399

209Mb CP3204 (IDE)
16ms 3.5" HH
Bare Drive \$619
16 Bit Kit \$639

MEMORY

ADD 1Mb RAM
AS LOW AS \$39

SIMM

1Mb x9 80ns \$49
1Mb x8 80ns \$39
Add \$2 for SIP
MEMORY FOR EVERY SYSTEM!

CD ROM DRIVES

YOUR OPTICAL EXPERTS
Ask about software!

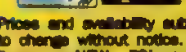
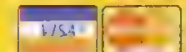
600Mb Internal External
CHINON \$419 \$539
TOSHIBA \$599 \$699

TOLL-FREE
TECHNICAL
SUPPORT

ALL ORDERS
SHIPPED VIA
EXPRESS



NEVER A SURCHARGE
for VISA, MC or Discover!



Prices and availability subject
to change without notice. All
items are NEW. PO's accepted
from qualified buyers-net 20.
Add \$13 shipping for EXPRESS
APO/FPO orders. PO's, 30-Day
Guarantee and 1-Year Replace-
ment Policy may have some
restrictions. Shipping is non-refund-
able. All trademarks are the prop-
erties of their respective owners.
12.31.91 HIX

Hard Drives International
Insight Distribution Network, Inc.
1912 W. 4th St., Dept. HIX
Tempe, AZ 85281

HARD DRIVES International

Another
Insight
Company

Insight

800/927-3167

HARD DRIVES
International

PURCHASE ORDERS/NATIONAL ACCOUNTS 800/927-9923



The Best Doggone Prices and Technical Support in the Market!

Sales Hotline: 1-800-438-6039 Shipping and International Customers 1-404-860-7364 FAX: 1-404-860-7358

Bulldog Systems

386-SX/20	1369
386-25	1539
386-33 (64K CACHE)	1639
386-25 (64K CACHE)	2239
STANDARD CONFIGURATION	
1 MG 1.2 FLOPPY 72 MB HD VGA Card DOS 4.01 PARA SERIAL PORT KEYBOARD 386 IN TOWER	
1 YEAR ON SITE WARRANTY	
100 MB HD	add 190
200 MB HD	add 415
VGA Monitor	add 299
1 MB Video	add 399
1 MB Ram upgrade	add 65
1.44 MB Floppy Drive	59

CALL FOR OTHER CONFIGURATIONS

Free shipping on all Bulldog Systems prepaid with a cashiers check, money order, or bank wire

Network

3C501 Etherlink II/Fivepack	195/69
3C501 P10 Base T	259
3C503B Ethernet Plus	379
3C501 Etherlink 16	279
3C523 MCA Ethernet	269
Starter Kit 2mbps/AE1/AE3	
LAN Cards 2mbps-AE2/AE3	135/199/239
Call for other Airtouch products at great prices!	
Novell Lite 1.0	79
Netware 2.25/10 User	649/1145
Netware 3.11/20/100 User	1950/3995
Ethernet NE1000/NE2000	135/159
PCI 10/PC130E	99/129
PC500WS/PC500PS	169/289
HL BR Active/Passive	269/69
TC6242/TC6242 TP+	85/99
TC6245/TC6245 TP+	199/219
TC6045/TC6045 TP+	199/219
Ethercard 8 bus 16 bit	149/169
Token Card 8 bus 16 bit	349/399
10 Base-T Card 8 bus 16 bit	185/205

Notebooks&Laptops

Metalix SX w/40 mb HD	1995
40/40/60	2225/2449
ULT 86 Plus	1495
NB 30 mb/40 mb HD	2067
NB 10 mb/40 mb HD	2039
CF270w/20mb	2019
CF 470 Notebook	2750
TI3000 w/40 mb	2699
Portable Palmtop	219
	525

Call for Pricing on Toshiba Laptops!

Modems & Fax

Datafax 2400 Modem/9600 Fax	99
Externally Yours Modem Fax	139
Smart Connect 2400/INT w/MNP5	65
PerleFax Fax 96 Fax Card	89
Telebarre Fax/Mod Switch	89
2400 INT/EXT	65/89
2400 INT/EXT w/MNP	119/145
2400 INT w/Sendfax	110
9600 INT/EXT	299/325
Fax 9600/4800	279/145
Communicator	389
Answering Machine	239
Fax 9600 w/Page Scanner	999
9600 ext V 42 Bis/9600 int V 42 Bis	519/489
2400 ext V 42 Bis/2400 int V 22	199/125
1200 Int/2400 Int/2400 Ext	99/75/169
2400 Int/Ext w/MNP	149/199
24/96 Fax Modem Int/Ext	245/309
1200P w/Easy	25
2400 Int/Ext	269/329
9600 V Series Int/Ext	525/659
Hayes V Series modem enhancer	25
Laptop Modem	125
2400 Int/Ext	129/169
9600 SA Fax	475
2400 Pocket Modem	109
9600 Courier HST Ext	509

Mice & Misc:

Microsoft Mouse w/Windows 3.0	149
Microsoft Mouse w/PC Paintbrush	109
Microsoft Ball Point Mouse	125
Logitech Mouseman Serial/Bus	69/79
Logitech Trackman Serial/Bus	79/85
Logitech Cordless Radio Mouse	135
PC Mouse III	79
White Mouse Serial/Bus	59/65
Trnplate BC-750/750 LAN	429/469

Printers

VGA Wonder XL 256k/512k	179/209
Ultra 8514 512k/1MB	399/529
Ultra 8514+ VGA 512k/1MB	469/599
Basic VGA/Super VGA w/512K	69/135
VGA 116	59
VGA 700/732 w/1MB	139/169
Graphics Station 1024+	949
Graphics Engine w/1MB	889
Prodesigner IIS 512K	199
VGA Plus 8/16	135/169
1024 256K/512K	149/197
8514A	429
Falcomnet 1280 degree w/1 MB	199
10241 256K/512K	119/149
VRAM II 512K/1MB	229/299

Printers

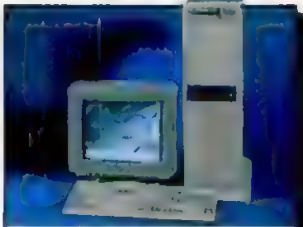
LX810	155
FX800/FX1050	289/409
LQ2500/LQ570	229/359
LQ2500/LQ1170	435/669
LQ2500	849
LQ1170	159
EPL7000/EPL7500	789/1839
1800s	299
Smart Label	189
182T Turbo 320	229/319
321/180	439/225
390 Plus/391 Plus	439/599
30 Mega/30 S Plus	919/999
84/48/30/60 LASER	1709/1389/1279
800/400 LASER	929/629
1180/1123/1124	159/219/275
1624/1654	349/539
1695/2624	369/409
4420/4450/4455	699/1079/1399
Laser Series III/IIID	1599/2539
Laser III/IIIP	899/1069
Desa Jet 500	489
IIIP/IIIToner	60/79
Pacific Data 1mb/2mb	99/139
Pacific Data 25 N-1	249
Pacific Bar Code/Pacific Outlines	315/187
Pacific Page PE/TKL	129/899
Pacific Type/Pacific Print	259/219
Plotter in a Cartridge-Headlines	229/199
Pacific Connect 256K	249
Complete Font Library	249
1 BP 47L BP IIII	819/1499
BT10EX	329

Monitors

2A/3D	419/579
3P/3X/4FG	665/799
4DS/5D	979/2150
1381/1391/1395	339/449/549
Play White ML4571	129
14" VGA Color CV 14681	319
CV B4581 Synmaster 2 31 dot	329
CV B4997 Synmaster 1 21 dot	349
9CM082	335
5468/5468N1	309/389
5436 Multisync 28	415
90701/90801	1019/1269

Memory Boards

Six Pack+ w/384K XT	129
Six Pack 286 w/OK AT	95
Ramquest 286 w/OK AT	319
Above Board+ w/512K XT/AT	285
Above Board II+ w/OK PS/2	219
Above Board 8 w/2MB AT	397
Ramquest 16/32 w/OK PS/2	199
Ramquest 8/16 w/OK XT/AT	129
ANT 5251 11 Enhanced Plus	489
DC A7ma Board III	405
DC A7ma Software	239
Orchid Tiny Turbo 286	205
Orchid Tiny Turbo Extra	249
Orchid Tiny Turbo AT	359
Intel Inboard 386PC w/1 mb	499



BULLDOG
486-33cache

4 mb RAM • 256k system cache • 200 mb Hard Drive • 486 processor running at 33 Mhz • Dual Floppy • Super VGA Card w/1 mb RAM (1024x768) • 14" VGA Color Monitor (1024x768) • M S DOS 4.01 • M S Windows 3.0

\$2995

For other configurations call Configured in a desktop

Software

Aldus Pagemaker	489
Carbon Copy	110
Claris ProDeveloper	449
Clippers 5.0	499
Corel Draw	365
Dbase IV	479
Designview 386	129
Enable/PA 4.0	459
Finewise V3.1	110
Fontbase/FontPro	195/449
FontPro Distribution Kit	299
Freelance Plus	309
Harvard Graphics	369
IBM DisplayWrite V	229
Lotus 2 3/3 1 Plus	345/409
Lotus Symphony	479
Lotus for Windows	415
Microsoft Windows 3.0 w/ord	109/219
Microsoft Word for Windows	319
Microsoft Excel for Windows	319
Norton Desktop for Windows	Call
Norton Utilities 6.0 Norton Anti Virus	109/85
Parachute II/Completer/Double Bonus	139/219
Paradox V3.5	429
QULA 4	289
Quattro Pro	299
Super Calc V	99
Ventura Desktop Publishing	479
Word Perfect 5.1	289
Wordstar 6.0/2000+	169/229

Scanners & Digitizers

Logitech Scan Man/Scanman 256	149/289
Sunbeamtech 12X121/2X18	139/549
Marstek 800 w/Paintbrush and OCR	155
Marstek 800 for Windows	155
Marstek 800 for Windows w/Perceive	379
Marstek Color Artist	799
MSC Color/Hand Scanner	635
Complete Full Page Scanner/Half Page Scanner	509/179
Complete Hand Scanner	155
Complete Continuumator	299
Color hand scanner	489
Classmate scanner	229
ProReader OCR Software	49

Crowd Pleasers!

Personal Modem

\$25

On Sale!

\$2.95

\$4.95

Leading Edge

\$1395

Tape Drives

40 Meg Int/Ext	239/349
60 Meg w/Coat Int/Ext	579
DJ10120 Meg Int Jumbo	249
DJ10120 Meg Int Jumbo	299
QPA 700 NEW 700 Meg Int	705
Dual Floppy Cable CK-17	25
External Kit KE-10	115
60F Int	239
60 MB Teac w/Card Int/Ext	575/689
100mb dual ext w/QIC-02	2395
5250 Portable SCSI	1495
Maystream 60 int w/coat	569
Maystream 150 int w/coat	769

Math Co-Pro

387 33	199
387 SX16/20	125/135
287-XL/XT	89
387 16/20	189
387 25/31	189/199
387 SX16/20	119/129
287XL	85
387-40	225
16SX-16/20/25	109/119/139
387 16/25/31	175
1 MB NIMM80ns	19
256K SIMM80ns	49
SIMM DRAM SIP	Call

Toll Free Sales Hotline

1-800-438-6039

P.O. Box 1190-610 Industrial Park

Drive/Eds, Georgia 30809

HOURS: Monday thru Friday 8:30 a.m. to

7:30 p.m.-Saturday 11:00 a.m. to 3:00 p.m.

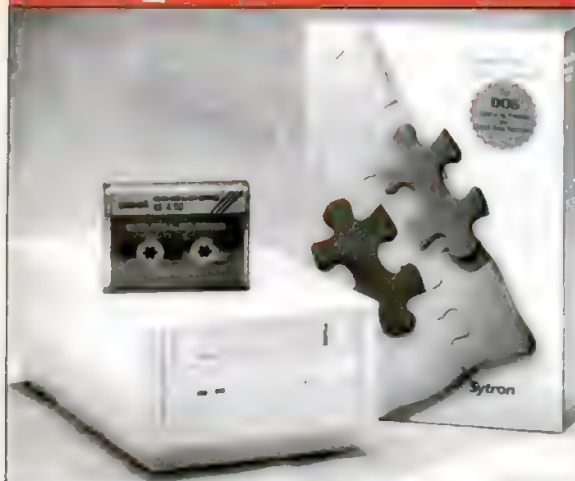


BULLDOG
COMPUTER PRODUCTS

CIRCLE NO. 481 ON READER SERVICE CARD

SALES
HOTLINE
1-800-438-6039

1.3 Gb
SCSI DAT
\$1499



High capacity Archive Python DAT Tape back-up system for IBM Compatibles

Archive's DAT drive provides these features:

Extremely high capacity on a small 4-mm DAT cassette...up to 2.0 Gigabytes on a 90-meter tape**.

High speed random access to any file on the tape (20-sec avg on 60-meter tape).

Uncorrectable error rate of less than 1 in 10^{15} bits 512 K data buffer.

Four Direct-Drive motors (4DD) eliminate belts and mechanical mode changes.

Python & Sytos Plus with an Adaptec® SCSI Host Adaptor feature:

Runs on PC-DOS, & MS DOS® (v 3.0 & up), Novell® Advanced Netware™ (v. 2.1 & up), IBM PC LAN Program® (v 1.12 & up) and other compatible networking environments (i.e. 3COM®).

High speed incremental or complete back-up.

Custom scripts for unparalleled flexibility in file selection.

MS-DOS is a Registered Trademark of Microsoft Corporation
IBM is a Registered Trademark of IBM Corporation
Novell is a Registered Trademark of Novell Corp.
Adaptec is a Registered Trademark of Adaptec Corp.

• 30-Day Money-Back Guarantee •

All products carry a 30-day money-back guarantee. Your risk in the transaction is the cost of shipping.

• Disk-for-Disk Replacement Warranty •

Quantum, Maxtor, Syquest and Archive drives carry a two-year "parts & labor" disk-for-disk replacement warranty. WREN, Teac, WangDAT, Conner, Micronics products and Syquest Cartridges carry a one-year "parts & labor" disk-for-disk (board-for-board) replacement warranty.

• Mounting Hardware & Cables Included •

All Hard Drives include rails, extenders and data cables required for standard operation. Board products are populated but without RAM.

• 30-Day Performance Guarantee •

If your drive product fails to perform properly in the first 30 days and our technical support staff can't solve the problem over the phone, we'll ship you a replacement drive overnight and have your defective drive picked up at our expense. Offer is subject to some limitations. Products being returned for credit and international orders do not apply.

• Toll-Free Technical Support •

Toll Free Technical Support, 9:30am to 7pm Monday thru Friday, Central Time. As often or for as long as you need

• Prices & Specifications Subject to Change Without Notice •

SyQuest
88Mb Removable
\$609

MODEL	Bare
SQ-555	399
SQ-5110₍₈₈₎	609
Dual_(ext. 44)	899
Dual_(ext. 88)	1449

Micronics
486 33 ISA Motherboard
\$999

386_{sx}	ISA 20	259
386_{dx}	ISA 25	419
386_{dx}	ISA/33/Cache	569
486_{dx}	ISA/25/Cache	1149
486_{dx}	ISA/33/Cache	999
486_{dx}	EISA/33/Cache	1549
MPort325	AC Portable	2999

DAT Tape
1.2 Gb Back-up
\$1499

TEAC I55	599
Archive Python	1499
WangDAT	1449
WangDAT	1999

Toshiba
CD ROM 3301B
\$579

Maxtor
213 Mb IDE
\$559

MB	SCSI	IDE
80	259	309
120	359	349
213	579	559
340	999	889
535	1599	N/A
760	1649	N/A
1.2G	2299	N/A

Quantum
170Mb SCSI*
\$499

52	229	199
105	339	319
170	499	Call
210	629	599
425	1299	N/A

*While Quantities Last

"Bare" Drive includes Drive, Data Cable, Rails & Extenders
• 8-bit SCSI kit (AIC) add \$109
• 16-bit SCSI kit (Adaptec 1520) add \$149
• 16-bit SCSI Bus Master kit (Adaptec 1540) add \$229
• 16-bit MCA SCSI Kit (Adaptec 1640) add \$329
• 32-bit EISA SCSI kit (Adaptec 1740) Add \$599
• 16-bit IDE Kit (Seagate St-07) add \$31
• 16-bit IDE Kit (Cumulus 124187) add \$79
• Many Models available with Floppy Controller

1-800 235-8935

FTS TECHNOLOGIES

INTERNATIONAL
TOLL FREE 1-800-235-8935
TOLL FREE 1-800-235-8935
TOLL FREE 1-800-235-8935
TOLL FREE 1-800-235-8935

Paradise

ORDER TOLL FREE: U.S. & Canada - 1 800 348-4PCP (4727)

Japan - 0031-11-1865

**In Hawaii
(808) 875-1100**

Australia - 0014-800-126-943

FAX - 1 (808) 875-0061

Shipping & Technical Assistance - 1 (808) 875-1108

COMPUTERS

IBM PS/2	
L40 SX	3300
PS/2 Mod 35 SX/40Mb	1450/1650
PS/2 Mod 40 SX 40/80 Mb	2195/2395
PS/2 Mod 50 Z 30/60 Mb	1250/1410
PS/2 Mod 55 SX 40/80 Mb	1995/2100
PS/2 Mod 57 SX 80/160 Mb	2895/3100
PS/2 Mod 70 A81/A16	3920/4300
PS/2 Mod 80 80/160/320 3275/3625/5075	
PS/2 Mod 90/95-486	Call

COMPAQ	
LTE 386 SX 30/60	3395/3735
SLT 386 60/120 Mb	4299/4750
DPro 386 S 20 Mod 1/40 Mb	1655/2150
DPro 386 E 40/110 Mb	2750/3033
DPro 386/25 E (All Models)	Call
DPro 386/33 L 120 Mb	4999

TEXAS INSTRUMENTS	
Travelmate 2000	995
Travelmate 3000 20/40/60	Call

AST	
Premium Exec Notebook 286 20/40	1925/2200
Premium Exec Notebook 386 20/40/60	1999/2250/2500
Premium II 386 SX/20	1275
Premium II 386/33	2199
Premium II 486 SX/20	2299
Premium II 486/33	3450

TOSHIBA	
T2000 SX 40/60 Mb	2937/3295
T2000 SXE 40/60 Mb	3295/3495
T2200	Call
T3200 SX 120 Mb	3550
T3200 SX Color	5695
T5200 100/200/Color	4199/4688/5924

DFI	
286-12 Mhz	487
386-16 Mhz	590
386 SX-20 Mhz	650
386-25 Mhz	1120
386-33 Mhz	1500
486-33 Mhz	1800

1-year on-site warranty
Call for Custom Configurations

PANASONIC	
CF-370	Call

MONITORS & TERMINALS

MONO/COLOR	
IBM 8503/8512	227/459
Samsung RGB	200
Amber 12" TTL	85

VGA/EGA MONITORS	
IBM 8506/07/08	899/629/928
IBM 8513/14/15	525/1150/699
Samsung VGA	259
Mitsubishi EGA	329
Mitsubishi 1381/HL6935	485/1900
NEC 2A/3DS	460/569
NEC 4DS/5D	989/2150
Packard Bell 8529/8541/8510	275/290/339
Panasonic 1381/1391	369/459

Samsung VGA/4581/4592	344/430/309
Sony CPD 1304	629
Zenith 1492	595

VIDEO BOARDS

ATI VGA Wonder 256/512+	199/240
Hercules GB 1024/1024+2	532/699
NEC Graphics Engine	895
Orchid ProDesigner II 512/1 Mb	239/299
Paradise VGA+/16	122/145
Paradise VGA 1024 256/512	159/199
Herc/Mono/w Parallel Card	45
VGA 1024 256/512	109/139

PRINTERS

CANON	
BJ 10 EX	329
BJ 300/330	Call

CITIZEN	
GSX 130/140+/145	259/299/399
HSP 500/550	301/421

DICONIX 150	
P/S	343/347

EPSON	
LX 810	173
FX 850	289
FX 1050	399
LQ 570	265
LQ 870	445
LQ 860	549

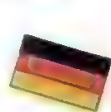
HEWLETT-PACKARD (Mac & 220V avail.)	
LaserJet 3/3D	1549/2399
LaserJet 351	3525
LaserJet 2P+/3P	849/995
DeskJet 500/Color	399/730
ScanJet + w/lf	1069
ScanJet IIC Color Scanner	1495
PaintJet/XL	695/1640

FONTS & MEMORY	
Pacific Data 25-1	259
Pacific Data 1/2/4 Mb	129/159/265
Pacific Connect Laser Share	299
Pacific Page PE/XL	349/721
Pacific Data Plotter in a Ctg	239
LaserJet Memory 1/2/4 Mb	119/149/245
Compaq 1/4 Mb Modules	118/383
IBM/Toshiba Memory	Call
CPI Jet Page/Superset 425+	299/259
CPI DeskRam 256k	125

IBM	
4029 Laser	Call
4019 E/4019 Laser	895/1395
Personal Printer II	Call
Proprinter 24P	365
ExecJet	780

NEC	
P-3200/3300	276/Call
6200/6300	476/645
Silent Writer 290/990	2450/2895
Silent Writer 2 Mod 90	1559
OKIDATA	
ML 182	228
ML 320/321	124/451
ML 380	289
ML 390+/391+	449/613
ML 393+/393+color	968/1055

Quality at the best prices under the sun.



Specializing in International Orders

OkiLaser 400/800	639/965
OkiLaser 820/830/840	1276/1495/1949
PANASONIC	
1123/1180	214/147
1124/1624	279/349
1654/1695/2624	548/364/479
4420/4450/4455	779/1129/1883

TERMINALS

Wyse 50/60	375/300
Wyse 30/85	310/339
Wyse 150/185	289/379

SOFTWARE

Aldus Pagemaker 4.0	495
Ashton Tate dBase III+/IV	419/479
Borland Quattro Pro 2.0	295
Carbon Copy 6.0	110
Clarion Prof. Developer	450
Compaq/IBM DOS	Call
Harvard Graphics 3.0	370
IBM Displaywrite 5.0	249
Lotus 1-2-3 2.3/3.1	329/399
Microsoft	All Titles-Lowest Price
Microsoft Windows 3.0	93
Norton Adv. Util 6.0	114
Procomm Plus	62
Quicken 5.0	45
Ventura Publisher V 3.0	479
WordPerfect 5.1	245
400 Additional Titles In Stock	

PLOTTERS AND DIGITIZERS

HEWLETT-PACKARD	
7475A/7550B	1349/2699
7570A/7575A	2699/3350
7576 EXL	3999

SUMMAGRAPHICS	
Summasketch 2 12X12/12X18	335/565

CALCOMP	
Pacesetter 2000	3150/3995
12X12/12X18	298/597

MULTIFUNCTION BOARDS CARDS & CHIPS

IBM 5250 Emulation	695
AST 5251 Emulation	499
AST 6-Pack w/384 k	145
Intel AboveBoard Plus w/512 k	289
Intel AboveBoard MC	285
Intel InBoard 386 PC	492
Cyrix Fasmath	Call
80287-XL	99
80387-SX/16/20/25/33	Call

MODEMS & COMMUNICATIONS

ATI 9600 ETC	399
CPI 2400 Internal	69
CPI 2400 Ext Fax	123
CPI 2400 Ext MNP	154
CPI 9600 Ext	439
Everex 2400/2400 MNP	99/164
Hayes 2400/2400B	319/218
Hayes Ultra 96	639

Practical Pocket Modem	99
Intel 2400/9600	217/499
MegaHertz Laptop Modems	Call
Practical Perif. 2400/9600	132/479
US Robotics HST/Dual	585/799

FAX MACHINES

Sharp FO 216/240/334	559/699/795
Intel Satisfaction/MCA	385/421
JT Fax 9600 B	339
CPI 2496 IF	173

MICE

Logitech C9/Bus/PS2	82
Logitech Mouseman	72
Logitech ScanmanPC/PS2	169/240
Microsoft Mice+/Windows 3.0	103/145
Microsoft Ballpoint	129

DRIVES & TAPES

Colorado DJ10/20	239/295
Conner 40/100/200	299/499/610
ST 225/238	189/192
ST 157A/251-I	229/239
Plus II XL50/105	388/578
Mountain	Call
Panasonic LF5010 Optical Drive	2215
Procom Ext 5.25 PS/2	199
Procom PS2 Hard Drives 120/200 MbCall	
Procom Laptop Floppy	Call

NETWORK

ARTISOFT	
Lantastic 2 Mb Starter Kit	338
Lantastic 2 Mb Adapter	139
Lantastic 10 Mb Starter Kit	469
Lantastic AE3 Starter Kit	539
Lantastic 10 Mb Adapter	199

NETWARE	
Netware 2.2 5-User	499
Netware 2.2 10-User	1159
Netware 3.11 10/20-User	1395/2040
Netware 3.11 100-User	4045

NE 1000/NE 2000	159/179
NE/2 /NE 3200 (EISA)	249/749

SMC	
Arctnet PC 130 8 Bit	99
Arctnet PC 500 fs 16 Bit	289
Arctnet PC 500 ws 16 Bit	179

MISC & ACCESSORIES

Keytronics KB101+	89
Kensington Masterpiece/Plus	85/95
AB Switch Box	27
TrippLite 450/1200/2000	296/618/1175
6 outlet surge	25

**Win
A Free
Hawaii Vacation!**

No purchase necessary

Most orders shipped insured next or second day air **FEDERAL EXPRESS** / 24-hour worldwide order tracking / Printer Orders received by 9 PM CST can be shipped same day / All credit card and COD orders checked electronically / We accept Amex, Visa, MC, JCB, Discover, Diners Club, COD's, Wire Transfer, Letter of Credit. **TERMS & LEASE AVAILABLE** (one day approval) / Credit cards not charged until product shipped **GOVERNMENT AND EDUCATIONAL P.O.'S ARE WELCOME** / Allow 10 days for personal checks to clear / Prices reflect a 3 per cent cash discount / Non-defective returns subject to a restocking charge. All warranties good through Paradise Computer Products / Prices subject to change without notice.

HOURS: 8:30 AM TO 8:30 PM CST MON-FRI, 10 AM TO 4 PM CST, SAT.
Paradise Computer Products Ltd. P.O. Box 890553 Dallas, TX 75389-0553

CIRCLE 145 ON READER SERVICE CARD



WE ACCEPT PO'S
FROM QUALIFIED FIRMS

M E M O R Y

NO SURCHARGE
FOR MC, VISA & DISCOVER

Individual D-RAM Chips

MEMORY FOR IBM & APPLE	60NS	70NS	80NS	100NS
1Meg x 1	5.25	5.00	4.75	4.40
4Meg x 1	—	—	34.00	—
1Meg x 4	—	—	26.00	—
1Meg x 4 (Zip Pack)	—	—	27.00	—
256 x 4 (Video Zip)	—	—	—	14.95
256 x 4	6.00	5.75	5.50	5.55
256 x 1	2.65	2.40	2.00	1.70
64 x 4	—	—	3.25	3.00
64 x 1	—	—	—	1.50

SIMM MODULES (Add \$5** for SIPP)

	30NS	60NS	70NS	80NS	100NS
1Meg x 9 (IBM)	CALL	51.00	48.00	45.00	41.00
4Meg x 9 (IBM)	—	199.00	169.00	159.00	—
256 x 9 (IBM)	—	23.00	21.00	18.00	17.00
512 x 36 2Meg (72 PIN)	—	—	—	120.00	—
1 x 36 4Meg (72 PIN)	—	—	—	209.00	—
2 x 36 8Meg (72 PIN)	—	—	—	479.00	—
4 x 36 16Meg (72 PIN)	—	—	—	995.00	—

INTEL Math Chips

8087	59.00	80287-8	89.00	80387-16	149.00	80387-25	219.00
8087-2	79.00	80287-XL*	109.00	80387-16SX	149.00	80387-33	219.00
8087-1	119.00	80287-XLT*	119.00	80387-20	219.00	—	—
80287-8	89.00	50% Faster	—	80387-20SX	159.00	80387-DX	229.00

CYRIX FASMATH PROCESSOR

• Programs executed up to 3X faster • Plug & object code compat. w/Intel
• **PC Week** • rated #1 over all math chips • **5 YEAR WARRANTY**
83087 16MHz — \$195 83587 20SX Ver — \$169 83587 16SX Ver — \$149
83087-20MHz — \$205 83087-40MHz — \$279 83587-20SX Ver — \$169
83087 25MHz — \$210 83087 33MHz — \$225

BOCA AT PLUS

16 BIT MEMORY BOARD FOR 286, 386 AT
8K-8Meg Bd • 4.0 LHM comp. • New 5 Yr Warr • Conventional, expd. & extd. memory supports DOS, OS/2, LIM/EMS & EEMS • Versatile split memory address, operates w/CPU speeds to 33 MHz • Supports Deskview, MultiTask Oper. OS — \$119 2Meg — \$199 BOCA AT PLUS V0 1 per. 1 ser., 8-4 meg. — \$159 4Meg — \$299 8Meg — \$485 BOCA AT V0 44 2 per. parts, 2 per. parts — \$79

IBM PS/2 SIMM MODULES

IBM PART NO.	WORKS WITH	LA. TRADE'S
30F5348 (512K)	30-286	38.00
30F5360 (2Meg)	25-286, 30-286, 50 MTHR BD	110.00
6450375 (1Meg)	80-111, 311	65.00
6450379 (2Meg)	80-111, 311	139.00
6451080 (4Meg)	80-A21, A-61, 80-A31, 80-111, 80-311	249.00
6450603 (1Meg)	35SX, 40SX, 55SX, Model-70 s, P-70	65.00
6450604 (2Meg)	35SX, 40SX, 50Z, 55SX, Model-70-E, 061, 121, P-70	99.00
6450608 (2Meg)	70-A21, A-61, B-21, B-61	105.00
78X8955 (128K)	25	35.00
1383679 (512K) (2Meg)	55SX, 55LS, 65SX, 40SX, 35XS, 35LS	159.00
34F2933 (4Meg)	P/S1	50.00, 139.00
6450902 (2Meg)	57SX, 90, 95, P-75	119.00
6450128 (4Meg)	57SX, 90, 95, P-75	299.00
6450129 (8Meg)	35SX, 40SX	479.00
6450130 (8Meg)	57SX	499.00
PS/2, LX40 (2Meg, 4Meg, 8Meg)	—	149.00, 249.00, 499.00

COMPAQ MEMORY MODULES

MODEL#	AMT. UPGRADED	COMPQ PART#	PRICE
System Pro	2Meg Module	115144-001	139.00
DeskPro 486/25	2Meg Module	115144-001	139.00
DeskPro 386/33	8Meg Module	115144-001	499.00
DeskPro 386/25, 386/20	2Meg Module	115144-001	139.00
DeskPro 386S	1Meg Module	113131-001	59.00
	4Meg Exp Bd	113633-001	139.00
	4Meg Exp Bd	113634-001	279.00
	1Meg Module	113646-001	79.00
	4Meg Exp Bd	113644-001	209.00
DeskPro 386/20E	4Meg Exp Bd	113645-001	279.00
DeskPro 386/25E	1Meg Module	113131-001	59.00
	4Meg Module	113132-001	199.00
DeskPro 286N, 386N, 386SX/20	1Meg Module	118688-001	59.00
	2Meg Module	118689-001	119.00
DeskPro 386/16	4Meg Module	118690-001	219.00
	1Meg Kit	108071-001	119.00
	4Meg Kit	108072-001	269.00
	1 2Meg Exp Bd	108069-001	309.00
	4-8Meg Exp Bd	108070-001	549.00
DeskPro 286	512K Kit	113012-001	79.00

BRANDNAME LAPTOP MEMORY

LAPTOP MODEL #	AMT. UPGRADED	TOSHIBA PART #	LA. TRADE'S COMPT. PRICE
Leading Edge D/LT 386SX	1Meg	—	119.00
Bondwell 8310, Plus	1Meg	—	119.00
NEC Prospeed 286, 386SX 16	1Meg	PC21-21	139.00
NEC Prospeed 286, 386SX 16	4Meg	PC21-22	499.00
NEC Prospeed 386	2Meg	PC31-21	179.00
NEC Prospeed 386	8Meg	PC31-22	799.00
NEC Prospeed 386SX 20	1Meg	PC43-21	169.00
NEC Prospeed 386SX 20	4Meg	PC43-22	499.00
NEC Ultralite 286F	1Meg	—	129.00
Sharp PC-6220	1Meg	CE 8218	139.00
Sharp 6640	2Meg	—	179.00
TI Travelmate 2000	1Meg	2568034 0001	139.00
TI Travelmate 3000	2Meg	2566996-1	119.00
Zenith 386SX Notebook	1Meg	—	129.00
Zenith Master Sport — 386SX, SL	2Meg	ZA-300-1 or 386SL	199.00
Zenith Super Sport — 286, 286E	1Meg	ZA-180-66	125.00
	2Meg	ZA-180-64	179.00
	2Meg	ZA-180-86	179.00
Everex Tempo LX	2Meg	PCA 00053 00	129.00
AST Notebook Prem Exec	4Meg	500814-003 386SX20	269.00
Sanyo 1718 NB	2Meg	MBC NBMEM2	129.00
Panasonic CF170, CF270	1Meg	CF 8A165	99.00
Epson NB3	1Meg	—	139.00, 319.00
Tandon	2Meg	NB386SX-20	CALL

All products Brand New & Guaranteed • We Buy Excess Inventory



20930 South Normandie • Torrance, CA 90502

TOSHIBA LAPTOP MEMORY

LAPTOP MODEL #	AMT. UPGRADED	TOSHIBA PART #	LA. TRADE'S COMPT. PRICE
T1000SE/KE/LE	1 5Meg	PC14-PA8311U	129.00
T1000SE/KE/LE	2Meg	PC14-PA8312U	169.00
T2000/T2000SX	1Meg	PC18-PA8316U	119.00
T2000/T2000SX	2Meg	PC18-PA8317U	179.00
T2000SX/T1000LE	4Meg	PC-PA8314U	379.00
T2000SX/T1000LE	8Meg	PC14-PA8315U	649.00
T2000SX/2200SX	2Meg	PC-PA2000U	189.00
T2000SX/2200SX	4Meg	PC-PA2001U	419.00
T2000SX/2200SX	8Meg	PC-PA2002U	719.00
T1200XE	2Meg	PC13-PA8306	119.00
T1600	2Meg	PC8-PA8302U	119.00
T3100e	2Meg	PC9-PA8340U	119.00
T3100SX	2Meg	PC15-PA8308U	119.00
T3100SX	4Meg	PC15-PA8310U	219.00
T3200	3Meg	PC6-PA7137U	219.00
T3200SX	2Meg	PC12-PA8307U	119.00
T3200SX	4Meg	PC12-PA8909	219.00
T3200SXC	2Meg	PC19-PA8318U	129.00
T3200SXC	4Meg	PC19-PA8319U	269.00
T5100	2Meg	PC7-PA8301U	119.00
T5200/T8500	2Meg	PC10-PA8304U	119.00
T5200/T8500	8Meg	PC10-PA8313U	499.00

LASER PRINTER MEMORY UPGRADES

HP 2, 2D, 3, 3D, 3P, 2P	10Meg, 20Meg, 40Meg	Panasonic 4455	10Meg, 20Meg, 40Meg
Panasonic 4420/4450	80.00, 125.00, 195.00	NEC 90, 290	—, 219.00, —
Panasonic 4450	99.00, 138.00, 229.00	QMS 410	129.00, 189.00, 299.00
Epson 8000, Action Laser	—, 149.00, 229.00	Brother HL-4	129.00, 189.00, 299.00
Toshiba Page Laser 6	—, 149.00, 229.00	Konica 3110	199.00, 279.00, 499.00
Packard Bell PB8500	—, 149.00, 229.00	QMS PS 815/825	Call, Call, Call
OKI 400	119.00, 169.00, —	TI XL/PS17/PS35	74.00, —, —
OKI 830, 840	Call, Call, Call	Canon LBP4	209.00, 259.00, —
IBM Laser 4019, 4019E	89.00, 135.00, 189.00	AT&T 593	129.00, 179.00, 279.00
IBM Laser 4029	129.00, 199.00, 319.00	STA L504	129.00, 179.00, 279.00
HP II Si	79.00, —, 229.00	—	—

H.P. COMPATIBLE FONT CARTRIDGE

IBM 4019, 4019E, FONT CARTRIDGE 200 Fonts	159.00
TURBO 25 Comparable to Pacific Data's 25 CARTRIDGES IN ONE!	119.00
TURBOSCRIPT™ 47 scalable fonts in any point size	229.00
TAX & FINANCE CARTRIDGE	129.00
Font for Epson & Toshiba Laser Printers	149.00

ORCHID RAM QUEST 16/32

9-Meg of Backing, Expanded or Extended Memory, Works with PS/2 Models 80, 96Z, 55SX, 80, 70, 60. Full Support for LIM/EMS 4.0 and OS/2 — 8 Week State Run
4 Year Warr. — Comes w/ser. Par Parts and Free Ser Cable
OK — \$199.00 2Meg — \$281.00 4Meg — \$363.00 8Meg — \$527.00
NO SURCHARGE FOR MASTERCARD, VISA OR DISCOVER. PURCHASE ORDERS ACCEPTED FROM FORTUNE 500, GOVERNMENT & INSTITUTIONS. Price & availability subject to change. California orders add 8.5% sales tax. Returned orders or ordered wrong parts are subject to a 10% restocking fee. Memory chips not installed in boards. We accept international orders shipped via UPS, Air, ARO. PRO orders welcome. All credit card charges verified for fraudulent use. **SOBRY, NO REFUNDS AFTER 30 DAYS — EXCHANGES ONLY.** We accept MC, VISA, Discover. AE prepped orders, purchase orders, wire transfer, COD to cash, cash & carriers checks. *ALL MANUFACTURE PARTS ARE FOR REFERENCE ONLY.*

310-782-9880 (previously area code 913)
FAX: 310-782-0240

CALL TOLL FREE

1-800-433-3726
(US and Canada)

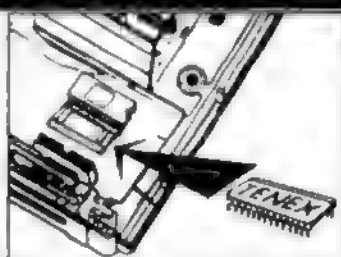
ESTAB. 1983 Mon-Fri, 8:00 a.m. to 5:00 p.m. PST
Sat. 10:00 a.m. to 12:00 noon

CIRCLE 493 ON READER SERVICE CARD

MEMORY & BUFFERS

Save time! **\$39⁹⁵**

The easiest, least expensive way to add 32K additional buffer memory to Panasonic KX-P dot-matrix printers and Citizen GSX-140/145 printers. Plugs into a waiting socket inside your printer. Ten-year warranty. Satisfaction guaranteed!



Add SIMM RAM—\$52 per MByte!

Easy plug-in SIMM modules (add \$2 for SIPP)
1MB x 9 70ns \$65
4MB x 9 80ns \$52
80ns \$299

Toshiba Memory Modules

T1000LE/SE/XE	1MB	\$169
	2MB	\$249
T3100SX, T3200SX, T1600, T3100E	2MB	\$159
T5100, T5200, T8500, T1200XE	2MB	\$159

Texas Instruments Notebooks

Travelmate 2000	1MB	\$199
Travelmate 3000	2MB	\$229

ZENITH Quality Upgrades

SuperSport 286 & 386SX 1MB \$159

COMPAQ fully compatible memory

DeskPro 386/20e, 386/25e, 386s	1MB	\$159
memory boards	4MB	\$359
DeskPro 286E, 386/20e, 25e, 20, 25, 386s	1MB	\$99
memory modules	4MB	\$299
386/33/33L, 486/25/33L, System Pro	2MB	\$189
memory modules	1-2MB	\$319
386/16 boards	4-8MB	\$549
386/16 module for systemboard	1MB	\$119
LTE286	1MB	\$119
	2MB	\$179
	4MB	\$449

Cyrix Math Coprocessors

TI microLaser memory Please Call

BOCA memory boards, 80ns RAM

8-bit memory board	1MB	\$189
	2MB	\$249
AT Plus, SIMM (BMB capacity)	2MB	\$249
	4MB	\$369

H-P LaserJet II, IID, IIP, III, IIID & IIIP

All memory boards are 100% H-P compatible and easily expandable up to 4Mbytes by adding chips
1MB \$99
2MB \$145
4MB \$245

Reconditioned toner cartridge \$59.95

IBM 4019/4019e memory Please Call

IBM PS/2 easy memory expansions

PS/1 Modules	512K	\$59
	2MB	\$154
286, 386, 30/286	2MB	\$149
30/286, 50Z, 55SX upgrade	2MB	\$149
70-E61/121/061	1MB	\$79
	2MB	\$139
70-A21/A611/B21/B61	2MB	\$149
80-111/311/111/121/321	2MB	\$159
Bare board for 50Z 55, 55SX, 60, 65SX	(2-BMB capacity)	\$379
Bare board for PS/2 70, 80	(2-BMB capacity)	\$379
Bare board for PS/2 70, 80	(2-14MB capacity)	Please Call
Additional 2MB for above boards		\$149
L40SX Laptop	2MB	\$215
	4MB	\$385
	8MB	\$849
AST fully compatible memory		
Premium 386C kits	1MB	\$85
	4MB	\$269

Note: Memory prices subject to change

TENEX
Computer Express
56800 Magnetic Drive
Mishawaka, IN 46545



Toll Free USA & Canada
1-800-776-6781
International 219-259-7051
FAX 219-259-0300

P3P

CIRCLE 306 ON READER SERVICE CARD

PROTECT YOUR COPIES OF PC MAGAZINE

Make your collection of *PC Magazine* a handsome addition to your office or home—and protect and organize your copies for easy reference!

PC Magazine Binders and Cases are made of durable, luxury-look leatherette over quality binder board. Custom designed for *PC Magazine*, every order receives FREE transfer foil to mark dates and volume numbers.

FOR FAST SERVICE CALL TOLL-FREE 1-800-825-6690

MAGAZINE BINDERS

Hold your issues on individual snap-on rods. \$9.95 each; 3 for \$27.95; 6 for \$52.95.

OPEN BACK CASES

Store your copies for individual reference. \$7.95 each; 3 for \$21.95; 6 for \$39.95.

INTERNATIONAL ORDERS WELCOME

"YOUR SOFTWARE SPECIALISTS"

TO ORDER CALL TOLL FREE

1-800-822-8088

★ CALL FOR OUR FREE CATALOG ★

GIVE US THE OPPORTUNITY TO BEAT ANY ADVERTISED PRICE

★ SUPER SPECIALS ★

Lotus 1-2-3 For Windows ..\$379

Ventura Gold For Windows ..\$469

PC Tools 7.1\$ 97

**SOFTWARE
ADD-ONS**

ACCOUNTING

Accpac Bedford Accounting	\$ 116
Accpac BPI G/A A/R A/P I/C	225
Accpac Easy G/A Payroll ea	54
Accpac Plus G/L A/R A/P Payroll ea	499
Accpac Plus I/C O/E R/I J/C ea	499
Accpac Plus Windowing Mgr	159
Businessworks Bundle	389
DAC Easy Accounting Payroll 42	85/57
DAC Easy Bonus Pr 42	118
DAC Easy Network	275
MicroBiz Retail Store Controller	489
One Write Plus Accounting System	169
Pacoh 2000	29
Peachtree Complete III Accounting	138
Peachtree v. Data Query III	207
Profitwise Power Pak	269
Profitwise Acclg (10 Pak)	219
Timeslips III	177

C.A.D.

Autocad 10	2499
Autocad v. 11	2899
Autosketch 3.0	137
DesignCAD 3.0	185
Design CAD 5.0	169
Drafix CAD Ultra	227
Generic 3D Drafting	205
Generic CADD 5.0	267
Generic CADD Starter Kit	85
Mathcad 2.5	295
Mathcad Advanced Math Pak	75
TurboCAD	75

COMMUNICATIONS

Brooklyn Bridge 30	77
Carbon Copy Plus	107
Close Up Customer	116
Close Up Support	139
CoSession 2 user	105
CrossTalk For Windows	114
CrossTalk Mark IV	125
Link Link Pro	80
Mail: v.	77
PC Anywhere III	57
PC Anywhere IV	93
PC Anywhere IV LAN	289
Procom Plus	62
Smartterm 240	209
Smartterm 320	129
Smartterm 400	119

DATABASE

Advanced Revelation	739
Alpha IV	287
AsaSam	207
Clipper 5.01	479
Database	529
Data Files	469
Data Files (Multiuser)	799
Dafaperfect	272
dBase III Plus	427
dBase IV 1.1	465
dBase IV Developer's Kit 1.1	785
dBase IV LAN	597
dBase IV Parallel	127
Filebase Plus 2.1 LAN	275
Filebase Plus 2.1 SIU runtime	249
Filebase 2.1 Single User	177
Filebase Plus 486	267
Filebase Plus LAN Runtime	352
File Pro 2.0	439
File Pro LAN 2.0	629
File Pro Distribution Kit	279
Informix 4GL Compiled Runtime	649
Informix 4GL Compiled Runtime	199
Informix SQL	579
Informix SQL Runtime	169
Informix Professional	899
Paradox 3.5	467
PC File 6.0	83
PC File LAN	269
PC Focus	849
PFS Professional File	172
Q & A 4.0	245
Quickstart Diamond	325
R&R Code Generator	95
R&R Reporter (dBase)	142
RBase for DOS 3.1	459
Reflex 2.0	157
UI Programmer 2.1	329

DESKTOP PUBLISHING

Adobe Illustrator Windows	\$ 309
Express Publisher	87
First Publisher 3.0	92
Freedom of the Press	232
Newsmaster II	24
Newsroom Pro	42
Pagemaker 4.0	469
Publisher 2.0	125
Publishers Paintbrush	269
Publishers Power Pak/WP or Word	44
Publisher's Type Foundry	309
Ventura Gold For DOS	469

FINANCE

Managing Your Money	115
Market Analyzer Plus	299
Money Counts	29
Money Matters	39
Quicktrk 5.0	39

GRAPHICS

Appraise II	229
Graphics Link Plus	99

Harvard Graphics 3.0	395
Micrografx Charisma	315
Statgraphics 4.0	589
Systat w/Sygraph 5.0	785

INTEGRATED

First Choice	95
Geoworks Ensemble	112
Lotus Symphony 2.2	462
Lotus Works	85
Microsoft Works	89
Smartware II	427

MOUSE & SCANNERS

MSI Mouse	45
Kensington Expert Mouse PC	95
Kraft Trackball	69
Logitech Mouse Man Bus	69
Logitech Mouse Man Serial	69
Logitech Mouse v. Paintshow	89
Logitech Mouse (Serial) Windows 3.0	127
Logitech Scanman 256	297
Logitech Scanman 32	169
Logitech Trackman	75
Microsoft Mouse	82
Microsoft Mouse v. Paintbrush	95
Microsoft Mouse v. Windows 3.0	139
MS Mouse II Pak	375
PC Mouse III	82
PC Trackball/serial	55

NETWORKING

Desklink 2.2	92
Lantronic Ethernet Starter	469
Lantronic Network Eye	129
Lantronic Starter Kit	339
Microsoft LAN Mgr Server	799
Novell Netware 2.2 5 user	589
Novell Netware 2.2 10 user	1349
Novell Netware 2.2 50 user	2499
Novell Netware 3.11 20 user	3749
Novell Netware 3.11 50 user	2249
Novell Netware 3.11 100 user	4699
Novell Netware 3.11 250 user	8499

PAINTING

Animator	282
Artline	389
Arts & Letters Graphics Editor	389
Calendar Creator plus	47
Coral Draw	355
Deluxe Paint II Enhanced	77
Designer 3.0	435
Dr. Halo 4	89
Draw Perfect	257
Flowcharting III	135
Formfiller	75
Formtool Gold	53
Formtools wh/ n file	85
GEM 3 Draw Plus	157
Grasp	239
Gray Fill	299
IBM Storyboard Live	279
Lotus Freelance Graphics	309
Org Plus Advanced	309
PC Globe	29
PC Paintbrush IV Plus	115
Per Form	39
Pizzaz Plus	62
Printmaster Plus	35
Printshop	115
Softtype	295
Xerox Formbase	215

PROGRAMMING

APL Plus/PC	449
Bo and C++	299
Brief Editor	182
Brief dBase	269
Clarion Personal Developer 2.0	445
Clarion Professional Developer 2.1	99
EDIT	292
Microsoft Basic PDS 7.1	532
Microsoft C Compiler 6.0	532
Microsoft Cobol Compiler	272
Microsoft Fortran 5.0	69
Microsoft Macro Assembler 6.0	229
Matrix Layout	59
Microsoft Quick C	59
Microsoft Quick Pascal	59
Microsoft Quickbasic 4.5	59
MS Quick C Assembler	120
MS Windows Development Kit 3.0	305
Powerbasic	75
RM Cobol 85	779
Smalltalk V For Windows	289
SPF/PC	142
Turbo Debugger	92
Turbo C++	64
Turbo C++ Plus	129
Turbo Pascal 6.0	89
Turbo Pascal Prof	182

PROJECT MANAGEMENT

Harvard Project Manager 3.0	419
Project Scheduler V	427
Superproject 2.0	639
Timeline 4.0	429
Timeline 4.0 LAN Pak	379

SREADSHEETS

Lotus 1-2-3	322
Lotus 1-2-3 3.1	559
Lotus 1-2-3 3.1 Plus	395
Lotus 1-2-3 3.1 Spreads	589
Lotus 1-2-3 3.1 Spreads	53

Microsoft Excel	292
Microsoft Multiplan	115
Quattro Pro 3.0	305
Quattro Pro LAN Pak	259
SuperCalc v.	85

UTILITIES

886 Max 5.1	67
Above Disk Plus	54
Ad Lib	215
Ami Day	109
Ami Menu	49
Batter Watch Pro	37
Calcf word	135
Check II	77
Control Room	29
Copy II PC	25
Copy II PC Deluxe Option Board	105
Corporate Ladder	30
House Control	175
Dan Brickline Demo II	57
Dan Brickline Page Garden	73
Direct Access	125
Direct Access Network	359
Direct Access Network	37
Direct Access Network	37
Direct Access Network	89
Direct Access Network	35
Direct Access Network	65
Direct Access Network	57
Direct Access Network	57
Direct Access Network	47
Direct Access Network	37
Direct Access Network	129
Direct Access Network	85
Direct Access Network	172
Direct Access Network	42
Direct Access Network	47
Direct Access Network	63
Direct Access Network	95
Direct Access Network	67
Direct Access Network	82
Direct Access Network	62
Direct Access Network	47
Direct Access Network	47
Direct Access Network	44
Direct Access Network	62
Direct Access Network	269
Direct Access Network	87
Direct Access Network	59
Direct Access Network	49
Direct Access Network	65
Direct Access Network	58
Direct Access Network	54
Direct Access Network	75
Direct Access Network	32
Direct Access Network	67
Direct Access Network	49
Direct Access Network	95
Direct Access Network	155
Direct Access Network	95
Direct Access Network	80
Direct Access Network	92
Direct Access Network	92
Direct Access Network	62
Direct Access Network	45
Direct Access Network	569
Direct Access Network	47
Direct Access Network	89
Direct Access Network	97
Direct Access Network	159
Direct Access Network	479
Direct Access Network	53
Direct Access Network	80
Direct Access Network	299
Direct Access Network	82
Direct Access Network	42
Direct Access Network	57
Direct Access Network	309
Direct Access Network	49
Direct Access Network	55
Direct Access Network	70
Direct Access Network	50
Direct Access Network	59
Direct Access Network	85
Direct Access Network	175
Direct Access Network	145
Direct Access Network	82
Direct Access Network	87
Direct Access Network	45

WINDOWS

AccPac Simply Accounting	125
Artor	379
Adobe Illustrator Windows	309
Adobe Type Manager	49
Adobe Type Mgr Plus Pak	119
After Dark For Windows	29
Berker Tools For Windows	69
Corel Draw	114
CrossTalk for Windows	173
Crystal Accounting	435
Designer 3.0	77
Desktop Set	399
Drafix CAD For Windows	187
DynaComm	57
Form Publisher	119
HDC First Apps	47
HDC Icon Designer	29
HDC Windows Express	379
Lotus 1-2-3 For Windows	209
Microcad For Windows	599
Microsoft Office For Windows	292
MS Excel 3.0	122
MS Project For Windows	87
MS Quick C For Windows	305
MS Windows 3.0	105
MS Windows Development Kit 3.0	87
New Wave	652
Norton Desktop For Windows	239
Objectivation For Windows	469
OmniPage Professional	290
Packrat 3.0	157
Pagemaker 4.0	44
Perform Pro	115
Powerpoint for Windows 3.0	405
Pro Write Plus For Windows	339
Publishers Power Pak for Windows	278
Soft Type	172
Superbase IV Windows	469
Sybiz Windows Accounting	75
Toolbox	119
Turbo Pascal For Windows	202
Ventura Gold For Windows	292
WinConnect	235
Window Works	119
WinFax Pro	69
Wordscan	362
Word Perfect For Windows	269
Wordscan Plus	645

WORDPROCESSING

Ami Professional	282
Grammatik For Windows	54
Grammatik IV	54
Grammatik IV LAN, 501	135
IBM Displaywrite V	235
Letterperfect	119
Microsoft Word 5.5	202
Microsoft Word For Windows	292
Multimate 4.0	235
Personal Law Firm	55
PS Professional Write	192
Rightwriter 4.0	52
Wordperfect 5.1	238
Wordperfect 5.1 (5 Pak)	1079
Wordperfect 5.1 (20 Pak)	3499
Wordperfect Office PC	79
Wordperfect Office PC (1.5u)	287
Wordperfect Office PC (1.20u)	999
Wordstar 6.0	199
Xywrite III	205
Zynder 3.1	289
Zynder Professional 3.0	205

XENIX UNIX

Informix 4GL Xenix 386	1599
Informix 4GL Xenix 386 Runtime	649
Lotus 1-2-3 for Unix V	499
M's Word 5.0 for Xenix	699
Norton Utilities For Unix	189
RM Cobol 85 for Unix 386	1499
SCO Forbase + 386 Run Xenix	299
SCO Forbase + 386 Xenix	649
SCO Lynx 386 Xenix	449
SCO Manager 386 Xenix	469
SCO Professional 386 Xenix	599
SCO Unix 386 Development System	585
SCO Unix 386 Operating System	635
SCO VPLIX (3+ user)	499
SCO Xenix 386/AT Operating System	269
Wordperfect for SCO Xenix	779
Wordperfect for SCO Xenix (1.10u)	599
Wordperfect for SCO Xenix (1.5u)	599

TO ORDER BY FAX:

215-639-7234
For Products not Listed call:
215-639-7110

Please send all correspondence to:

Software Add-Ons
Two Greenwood Square
3331 Street Rd., Suite #155
Bensalem, PA 19020



Policies

- 1 - We accept VISA, Mastercard & Discover - No Surcharge
- 2 - Shipping - any item - \$6 or more add 1%
- 3 - COD Charge of \$5 per order
- 4 - Purchase Orders must be approved
- 5 - International Orders welcome (except Canada)
- 6 - DEALERS & VAR INQUIRIES WELCOME
- 7 - Returns are subject to approval - 10% restocking fee



BookNet

PC Computing Guide to Quicken 5.0

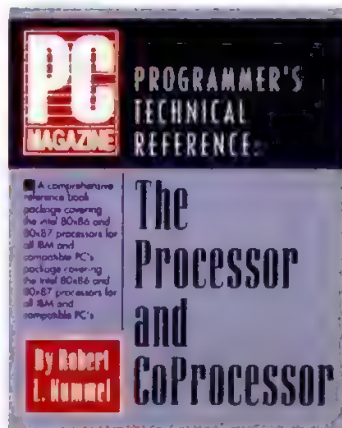
Learn how to use Quicken 5.0 to manage your money. The only and practical guide. PC Computing's founding publisher and columnist Michael E. Kolowich reveals techniques for saving money, managing your money, and more. Includes 5.0 software. On a 5.25-inch disk. Available to you.



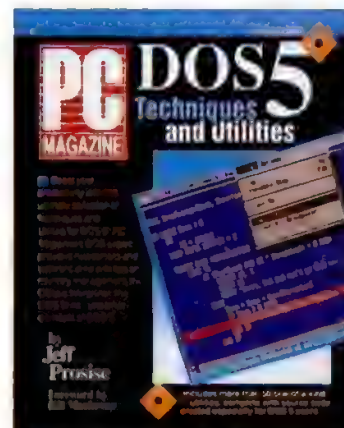
by Michael E. Kolowich

Foreword by Sara Calkins, founder and president of Inet Software

PC Computing's founding publisher and columnist Michael E. Kolowich gives you the insider's view on how to get the most out of Quicken 5.0. In a clear, easy-to-follow style, this practical guide takes you step-by-step through successful strategies for managing your finances, offering many time and money saving tips.



PC Magazine has put together the indispensable sourcebook for programmers in this comprehensive reference. Expert Robert Hummel covers the evolution, architecture, and programming of Intel's 80x86 and 80x87 processors, and includes the latest information on the 80486. Filled with explanations, diagrams, and references, this book is the ultimate processor handbook for programmers of all skill levels.



Jeff Prossie, the nationally recognized DOS expert and author of PC Magazine's "Tutor" column, takes you far beyond the manual to help you achieve peak performance with DOS 5. This comprehensive book offers everything from configuring your system to constructing batch files.

◆ Includes two 5 1/4" disks with one-of-a-kind DOS 5 utilities, including programs that dial your phone, search disks for files, and more.



BookNet Order Form

Name _____

Address _____

City _____ State _____

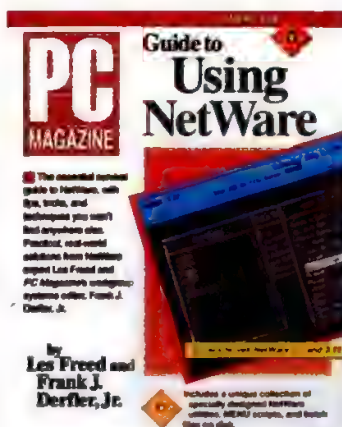
Zip _____ Telephone (____) _____

Payment By: ☐ Visa ☐ MasterCard ☐ American Express

☐ Check/Money Order (payable to Ziff-Davis Press)

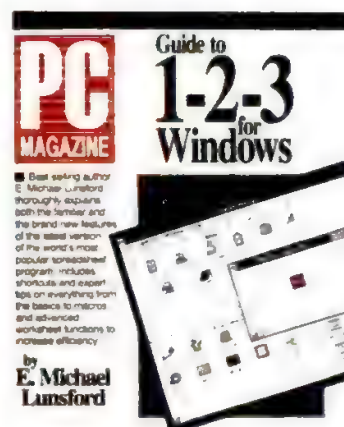
Card # _____ Exp. Date _____

Signature _____



Here are the insider tips, tricks, and techniques for NetWare you can't find anywhere else. NetWare expert, Les Freed, and PC Magazine's workgroup systems editor, Frank Derfler, combine years of experience to give you effective, real-world solutions.

◆ Includes one 5 1/4" disk with specially designed NetWare utilities, MENU scripts, and batch files.



This easy-to-use tutorial is an indispensable companion for both beginning and experienced users. It offers straightforward instruction in the fundamentals of 1-2-3 for Windows as well as expert training in more sophisticated features. Lotus expert E. Michael Lunsford brings you insider tips and techniques to help you get the most from the powerful features of 1-2-3 for Windows.

How to order Ziff-Davis Press books:

✉ Mail order form to Ziff-Davis Press BookNet 5903 Christie Ave. Emeryville, CA 94608.

✉ Fax order form to Ziff-Davis Press BookNet at (510) 601-2099. Credit card orders only.

☎ Call toll-free 1-800-688-0448 and have your VISA, MasterCard, or American Express card ready. In Canada, call 1-800-263-4374.

☎ Ziff-Net Online Services command lines: GO ZNT GO ZDBOOKS. Credit card orders only.

Prices subject to change without notice.

3003

1-800-688-0448

by
Joe Salemi

Advisor

Help for Readers Making Personal Computer Decisions

APPLETALK FOR THE PC

I am writing to you because I have to connect my IBM PC compatible to an AppleTalk network and don't know who makes a PC interface to AppleTalk. I'd like to run *Windows*, but I'll take what I can get. Any suggestions?

Joe Dante
Hampton, New Jersey



There are a number of AppleTalk cards available for ISA (Industry Standard Architecture) and MCA (Micro Channel architecture) systems, and even one for Toshiba laptops.

DayStar Digital (Flowery Branch, GA 30542; 800-962-2077, 404-967-2077) offers the \$249 LT200 Connection PC for ISA systems and the \$399 LT200 Connection MC for MCA systems. Both come with software drivers that allow the PC to use the network's printers; the software is compatible with MS-DOS 5.0 and *Windows* 3.0. Drivers that let the PC user log-on to an AppleShare server are also provided but are currently compatible only with DOS 3.3 and earlier. DOS 5.0 drivers are under development and should be available by the time this is in print.

Everex Systems (Fremont, CA 94538; 800-821-0806, 415-498-1111) sells its AppleTalk-compatible SpeedTalk ISA board for \$149. However, connecting a PC to an AppleTalk network requires more than just the card; you'll also need a workstation copy of *DosTOPS* (Sitka Corp., Alameda, CA 94501; 800-445-8677, 415-769-9669; \$249) to be able to use the AppleTalk peripherals. If you use *DosTOPS*, be sure to ask Sitka for tech note number 1306; it will supply you with the information needed to use *Windows* 3.0 on a *DosTOPS* workstation.

The FlashCard series from

- **APPLETALK FOR THE PC:** Connecting your PC to a Macintosh-based LAN.
- **SPEEDING UP dBASE ACROSS A NETWORK:** How to get better performance from *dBASE* applications on a LAN.
- **THE MOST PORTABLE PRINTERS AND FAXES:** Sending and receiving faxes on the road.
- **WHAT DO YOU NEED TO USE DYNAMIC DATA EXCHANGE?** The types of products needed to make hot links.
- **UPDATES:** New info on previous answers.

Sitka Corp. includes the FlashCard Toshiba, which fits in the internal slot of the Toshiba T1600, T3100SX, T3200SX, T5100, and T5200 laptops, and retails for \$329. The FlashCard for the ISA bus is \$239, and the FlashCard MC for MCA systems is \$329. All three cards also require a copy of *DosTOPS*.

SPEEDING UP dBASE ON A NETWORK

For several months now, I have been trying to get *dBASE IV* to run efficiently on a small (15 workstations) Novell *NetWare* 2.15 LAN. I have talked to Ashton-Tate several times, but the company has been of no help.

The problem is the amount of time it takes to perform certain tasks on the network, especially queries that contain linked databases. Our network workstations are a mixture of XT's and AT's and do not have extended or expanded memory, and we do not want to undertake this added expense. Therefore, using *dBcACHE* is not a possibility. However, our network server is a 33-MHz 386 machine, so there should be plenty of speed at that end.

Surely, there are others running *dBASE IV* on a Novell network. I can't believe that they would put up with the poor performance we are experiencing. Do you or your readers know of any reasonable solutions to this problem?

Diana M. Kolar
Cincinnati, Ohio



The problem lies not with *dBASE*, nor with the server; it's a limitation of the file-server-based LAN architecture.

No matter how fast the server is, under a LAN operating system like Novell's *NetWare* 2.x, all it does is respond to the LAN user's requests for files and printer services; the server itself isn't processing your data. The speed of the server affects only how fast it can respond to those requests.

The bottleneck is at the workstations, where the processing is actually taking place. When you load *dBASE*, the server finds the executable and data files and sends them down the wire to the workstation. From that point on, the workstation is processing the application as if it were a stand-alone machine, within the limits

of its own processor.

You can gain better performance by loading the *dBASE* program files from the workstation's hard disk (leaving the shared data files on the server); however, the only realistic way to speed up the processing is to speed up the workstations.

This is easily done by adding more memory: Add expanded memory to the XT's and extended memory to the AT's. This will allow more data to remain in the workstation's RAM and reduce the amount of traffic on the network. Or you can speed up the workstations through the use of speed-up boards or replacement motherboards. Either way, the solution involves an investment in your existing equipment.

A better (though in the short-term, potentially more expensive) solution to this problem does exist: moving your database to the client/server architecture. While the full technical details of this architecture are beyond the scope of this column, the advantage of the client/server architecture in your situation is that the database processing is split between your relatively slow workstations and a much faster server.

The workstation (client) runs a front-end package that sends the data requests to the database server, which does the actual data processing and sends only the results back to the client. This increases overall performance by reducing the amount of traffic on the network, as well as reducing the dependency on the slower workstations for the actual data processing.

To date, the most common client/server databases engines are based on either OS/2 or Unix.

However, Novell's *NetWare* 3.11 supports the client/server architecture through the use of NLMs (*NetWare* Loadable Modules). Your first step to mov-

Advisor

ing your database application to this architecture would be to upgrade your current LAN to this version: The package costs \$3,450; to upgrade from *NetWare 2.0a* or *2.1x* costs \$1,420 for 20 users. The next step is to purchase a copy of *ExtendBase for NetWare/386* (Extended Systems, Boise, ID 83704; 208-322-7575; \$395), an NLM that provides client/server functionality for *dBASE* data files. You will also need a copy of *Clipper* (Nantucket Corp., Los Angeles, CA 90006; 800-669-2547, 213-390-7923; \$795) to compile your *dBASE* application and enable it to use the *ExtendBase* services. Extended Systems has *Query Processor* and *1-2-3 DataLens* front ends available for \$95.

While this may seem like a complicated way to speed up a database, the increase in performance is worth it; in our First Looks article on *ExtendBase* (October 29, 1991), we found that it generally cuts data processing time dramatically. For example, a LIST command performed in one-third the amount of time it would take under *dBASE* alone.

Upgrading the workstations or server is a one-time cost that has the potential to be offset by the savings of increased efficiency, as your database users spend less time waiting for the data and more time using it. Your ultimate decision on which method (if any) is the best for your needs can be determined by asking one simple question: Will the overall cost of upgrading your hardware and/or software be offset by the potential long-term savings in your personnel's time?

THE MOST PORTABLE PRINTERS AND FAXES

I have a Compaq 286 LTE (40MB hard disk, 2.5MB RAM, 2,400-bps modem) and am considering the Canon BJ-10e portable printer.

What combination of hardware and software would most effectively provide me with a portable printer/fax combination? Outgoing faxes would be from a file and would not require a scanner.

Andy Baumer
Idaho Falls, Idaho



The Canon BJ-10e Bubble Jet printer weighs about 4 pounds and is roughly the size of a laptop.



The simplest solution for sending faxes from a laptop system is The Complete Fax/Portable Plus (The Complete PC, San Jose, CA 95131; 800-634-5558, 408-434-0145; \$499). This pocket-size fax/modem combination supports sending and receiving CCITT Group 3 faxes at 9,600 bits per second, and also includes a 2,400-bps modem that supports MNP 5 data compression and V.42 error control.

The included software operates in the background, and transmission times can be scheduled for when the phone rates are lower. It also automatically generates a cover page and will let you broadcast a fax to a number of different phone numbers with one command.

There are a number of portable printers, but you can't go wrong with the Canon BJ-10e (Canon USA Inc., Lake Success, NY 11042; 516-488-6700; \$499). This compact Bubble Jet printer weighs a little over 4 pounds and can either be plugged in or run off an optional rechargeable battery pack (\$50). It uses plain paper and emulates either the IBM Proprinter X24E or the Canon BJ-130e, making it compatible with the drivers in a wide variety of text or graphics applications.

You should be aware, though, that regardless of the printer you choose, printing out a fax from a PC is a slow process, as it consists entirely of graphics images. Because of this, fax software vendors usually provide a method of viewing the fax on-screen first, giving you the opportunity to decide if it's worth taking the time to print.

WHAT DO YOU NEED TO USE DYNAMIC DATA EXCHANGE?

Is it possible to achieve dynamic data exchange (DDE)—the dynamic linking of databases, word processors, and spreadsheets—in an environment other than *Windows 3.0*, and with applications other than those specifically designed for *Windows*?

I know that Quarterdeck's *DESQview 386* lets you do multitasking, but it does not permit DDE.

I would be interested in DDE among Ashton-Tate's *dBASE IV 1.1*, Borland's *Quattro Pro 3.0*, and Micropro's *WordStar 6.0*, but so far the only answer seems to be to purchase Precision Software's *Superbase 4*, and Microsoft's *Excel* and *Word for Windows*.

Hope you can get me out of the fog.

Dario Castellanos
Valencia, Venezuela



Dynamic data exchange (DDE) is one of a number of Interprocess Communication methods (IPCs) that we've been hearing a lot about lately. Put simply, an IPC is a method whereby programs running under a multitasking operating system (such as *OS/2* or *Unix*) or an operating environment (such as *Windows* or *DESQview*) on the same PC can communicate with each other, sharing data blocks and streams.

DDE is a specific form of IPC that's dependent on a message-oriented interface. To date, there are only two such interfaces in the IBM PC world—Microsoft *Windows 3.0* and the *OS/2* Presentation Manager.

IPC services have to be provided by the operating system or environment, and only programs

written to that environment's application program interface (API) can use them. That's why only *Windows* and Presentation Manager programs can exchange data dynamically in their respective environments.

The programs you've mentioned have to be rewritten as *Windows* programs to be able to use DDE services, and the vendors are doing just that. Borland International is working on *Windows* versions of *dBASE* and *Quattro Pro*, which will be released in coming months.

Micropro, now known as WordStar International (Novato, CA 94949; 800-227-5609, 415-382-8000), has updated *WordStar* to be *Windows* compatible. It has just released *WordStar for Windows*, which does let you establish DDE links with other programs that support DDE.

DESQview also has its own IPCs, but at this point very few programs have been adapted to take advantage of them.

Another IPC that's getting a lot of attention these days is called named pipes. A named pipe establishes communications between applications running on different PCs and is most commonly used to support the client/server architecture that I discussed previously. Named pipes are the exception to the general IPC rule—that the applications all be running on the same machine; for example, with the proper drivers, a DOS LAN workstation can use named pipes to serve as a front end to an *OS/2*-based database server.

UPDATES

Sydex, the vendor of the shareware one-pass floppy disk copying program *CopyQM* (Advisor column, September 24, 1991), has moved. The company is now located in Eugene, OR 97405, and can be reached by voice at 503-683-6033, or on its BBS at 503-683-1385.

ASK THE ADVISOR

Send your question to PC Advisor, One Park Avenue, New York, NY 10016, MCI mailbox PC MAGAZINE, or upload it to PC MagNet (see the instructions for joining on page 10 of this issue). Sorry, but we cannot send personal replies. ■

Windows

An every-issue four color section featuring quality products for the Windows environment.

436

Premier

The color showcase that puts the spotlight on leading-edge PC products and services.

437-445

Classified

Flexible-format display advertising: computer systems, components, software and more.

446-455

BusinessCard

A forum for innovative, hard-to-find and low cost PC hardware, software and services.

456-462

	Premier	Classified	Business Card		Premier	Classified	Business Card		Premier	Classified	Business Card
HARDWARE				Communications	442	449	457	Project Management			
Add-In-Boards	437	446	456	Computer Languages			457	Public Domain/Shareware		451	
CD-ROM		446	456	Construction			457	Real Estate			461
Communications	437		456	Data Base			457	Religion	444	451	461
Computer Systems	438	446	456	Data Entry		449		Sales Marketing			461
Connectivity				Desktop Publishing	436			Scientific		451	461
Disk Drives	440		456	Diagnostic	442			Security		451	
Diskettes		447		Education	442	449		Statistics		452	461
Expansion Units	440	447		Engineering		449		Surveys			461
Input Devices				Entertainment/Games		449	457	Taxes		452	
Monitors			456	Financial	443		457	Utilities	444		461
Peripherals	440			Flow Chart	443		457	Windows	436		461
Peripheral Sharing Devices				Fonts		450		Word Processing			
Power Supplies				Foreign Languages		450	457	MISCELLANEOUS			
Printers	441	448	456	General			457	Accessories	445		462
Rentals				Graphics	443	450	458	Bar Coding	445	452	462
Security				Health			458	Books/Catalogues		454	462
Storage				Inventory			458	Business Opportunities			
Tape Drive Subsystems	441	448	456	Mailing Programs		450		Data Conversion		454	
SOFTWARE				Manufacturing			458	Data Recovery Services		454	
Accounting		448	457	Mapping				Disk Conversion		454	
Backup Systems				Medical			458	Diskette Copy Services		455	462
Business			457	Multi-User Systems				Insurance		455	
Business Time Management				Music	444	451		Services			462
CAD/CAM	442			Preventive Maintenance		451	458	Supplies		455	
				Programmers Tools		451	458	Training/Tutorials			462

How to Make Great Color Images!

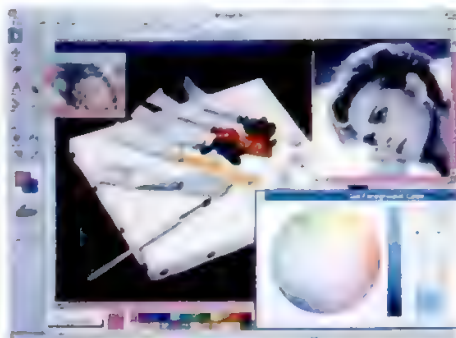


Image-In-Color software for Windows 3.0 is the most advanced true-color, CGA, VGA or 24-bit image processing system available for the PC! Spectacular functions provide a darkroom on your desk, with precise control of pressure, density and size of retouching tools such as pencil, paint brush, air brush and others. Clone items in an image instantly! Use photographic filters for powerful dimensions in design. CMYK color separations are super fine-tuned and calibrated by Agfa Compugraphic. Supports HSV and RGB color, with intuitive color picking. Supports all popular scanners and 16- or 24-bit video boards including:

Hercules
Matrox
Mona Lisa (OPTA)



Raster Ops
Truevision
Video 7

IMAGE-IN
INCORPORATED

1-800-345-3540

406 E. 79th St. • Minneapolis, MN 55420 • FAX 612-888-3665
Outside N. America call CPI, Geneva ++41-22-436-800

CIRCLE 901 ON READER SERVICE CARD

THIS SECTION OPEN ONLY TO WINDOWS ADVERTISERS

...looking for the best way to open up new opportunities with 800,000+ brand specifiers—the lion's share of buyers for the record-breaking 5 million copies of Windows sold in just 18 months. Place your four-color ad where they come to buy again and again!

PC Magazine Premier Windows.

Call 800-825-4237 for space!

WINDOWS OF OPPORTUNITY!

Now you can target the fastest-growing segment of the computer market—the Windows market—with an affordable color ad in the Premier Section of PC Magazine. Not only the biggest computer publication of all time, but the most regularly read publication by PC buyers. Now, PC Magazine Marketplace's Premier—the dazzling color showcase for leading-edge PC products and services—rolls out an exclusive set of display pages only for Windows advertisers.

Place your Windows ad in Premier and open up new opportunities with PC Magazine's 800,000+ PC brand specifiers—by far the lion's share of buyers for the record-breaking 5 million copies of Windows sold in just 18 months.

PC Magazine Premier Windows: the power of four-color advertising in three crisp, attractive ad sizes, just like the rest of Premier. Designed to beautifully showcase your Windows product or service. PC Magazine readers don't go "window-shopping". They come to buy. Be there when they do.

PC MAGAZINE PREMIER WINDOWS.

Call today to reserve your space! 800-825-4237

Professional Video Quality Without Compromises



If you think your PC can't produce video that meets broadcast standards, you haven't seen VGA Producer PRO!

**VGA
PRODUCER
PRO**

MAGNI

Magni Systems, Inc.
9500 SW Gemini Drive
Beaverton, OR 97005 USA
(800) 624-6465 (MAGNI-OK)
(503) 626-8400
FAX (503) 626-6225
BBS (503) 641-1859

Magni is a registered trademark of Magni Systems, Inc.
Magni and VGA Producer PRO are trademarks of Magni Systems, Inc.

CIRCLE 902 ON READER SERVICE CARD

UNICORE Presents

ROM-BIOS UPGRADES

For Your IBM or Compatible-A New BIOS Upgrade Will

- Support Windows 3.0 • Support 360K 720K 1.2MB & 144MB Floppy Drives • User defined hard drive types • Support VGA • Novell & Netware compatible • Expanded hard drive table • Enhanced 101/102 keyboard • 100% IBM compatible • Complete documentation • Latest Version • Complete set up in ROM



1538 Turnpike St. • North Andover, MA 01845
(508) 686-6468 • FAX (508) 683-1630

FA3.0

For Windows 3.0

Instantly Makes Windows Perform up to 550% Faster!

Cost efficiently eliminates time and wait, and increases speed of all software systems, including DOS. Works with conventional, extended or expanded RAM. Over 5 times faster than windows own caching software. Supports hot key controls for instant response and navigation.

ORDER TODAY

1-800-800-2467

UNICORE

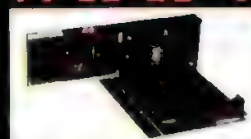
CIRCLE 905 ON READER SERVICE CARD

Alpha Systems Lab, Inc. Universal Upgrade Specialist

Is Your Computer A

WIMP?

AT&T 5300, Compaq, AST, NEC,
Wang, Zenith, Xerox,
IBM PC XT AT Compatibles



No Need To Buy New System.

We Have The Solution For You!
Design & Manufacture
FREE INSTALLATION
3 Years Warranty, **MADE IN USA**
286-12MHz, 1MB only \$250.00*

Available Now 386DX, 486DX and 486SX.
Direct Form Fit Replacement Motherboard,
Compatible with existing hardware, software,
and peripherals. OEMs Welcome!
Tel: 714-830-5838, Fax: 714-587-9473
8 Hammond Drive, Unit III, Irvine, CA 92718

CIRCLE 906 ON READER SERVICE CARD

Sound like A MILLION BUCKS!

**BLAST YOUR MESSAGE THRU
VOICE MAIL
CALL PROCESSING
TELEMARKETING**



Let Voice Solution transform your PC/XT/AT/386 into a multi-line voice processing command center. Have your computer intelligently process your sales, inquiries and messages. Complete package

Single Line (SignOut) ... \$295.00
Multi-Line ... \$995.00

Call: (510) 522-3800

FAX: 510-522-5588

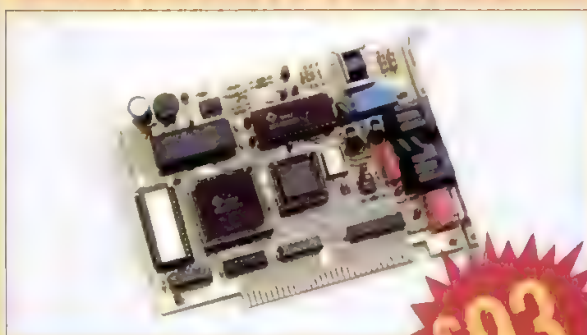
*Developer OEM packages available.
VISA MC AMEX CD

TALKING TECHNOLOGY, INC.
1125 ATLANTIC AVE. • ALAMEDA, CA 94501



CIRCLE 903 ON READER SERVICE CARD

The Ultimate 96/24i Send/Receive Fax Modem



\$93

- Compatible with all Group III Fax Machine
- Auto receive, print and save incoming fax
- Time scheduled transmission
- Fax mail merge
- Directly fax any Word, Multimate, Wordstar or Word Perfect file
- Powerful BitFax and BitCom Software MNP

96/24p PLUS MNP Send/Receive Pocket Fax/Modem ... \$219

96/24 Hardware MNP Send/Receive Fax Modem ... \$129

Toshiba Notebook 96/24 Int. Fax Modem V.42bis + mnps \$195

2400 bps Internal Modem ... \$49

Bit Fax Software for Windows 3.0 ... \$59

All Fax/Modem
come with
BitFax/BitCom
Software

No surcharge for VISA MC, 30 days money-back guarantee. PC with credit approval. Dealers welcome. Hours (P.T.) 10:00 am to 6:00 pm Monday-Friday

(415) 490-2233 ComPower Inc.

46560 Fremont Blvd., Suite 115, Fremont, CA 94538 Fax: 415-492-9667

CIRCLE 907 ON READER SERVICE CARD

386 POWER!

286 to 386 upgrade-\$199

Affordable! Slotless! The Evergreen 386 SuperChip II is a replacement chip that converts your 286 IBM, Compaq, or AT compatible to a 386SX. Run all your present software and hardware plus Windows 3.0 in the enhanced 386 mode and you can utilize DOS 5.0's Loadhigh and Devicehigh programs or other memory management software. Speed up your processor (increase on an AST Premium 286 using Norton SI version 4.5 goes from 11.2 to 15.6!) Math accelerator board available for your 287 Math Coprocessor.



**Evergreen
Technologies**

1325 NW Ninth St.
Corvallis, OR 97330-4508
503 757-0934 FAX 503 757-7350

800 733-0934

CIRCLE 904 ON READER SERVICE CARD

PC-EXPANDER

by cybex



Connect up to 8 Keyboards and Monitors to a Single PC

- PC, XT, AT and 100% IBM Compatibles
- MDA, CGA and EGA Video
- Only 1 Keyboard may be active at a time
- Selectable Takeover Delay up to 10 seconds
- Single output cable for each Keyboard/Video Channel
- Internal/External power selectable

Cybox Corporation

2800-H Bob Wallace Ave • Huntsville, AL 35805
(205) 534-0011 • FAX (205) 534-0010

CIRCLE 908 ON READER SERVICE CARD

ALL IN ONE: ONLY \$595

FAX SCANNER PRINTER COPIER



SEND, RECEIVE, SCAN, PRINT, SCHEDULE FILES FROM / TO PC
WORK UNDER DOS & WINDOWS ALSO WORKS
AS STAND-ALONE FAX

COMPREX, INC. 1-800-626-8112
312 Broadway (617) 354-5045
Cambridge, MA 02139 FAX (617) 864-9516

Visa, MasterCard, American Express

CIRCLE 910 ON READER SERVICE CARD

LIMELIGHT

Is where you'll be
with over 800,000 brand specifiers
after your colorful ad runs here.

Call 1-800-825-4237

BLACKSHIP
386SX/286
LAPTOPS
NOTEBOOKS

**ONSITE
SERVICE**
GE Computer Service

386SX/286 Laptop \$1095
386SX/286 Laptop (CGA) \$1195

Affordable PC Power!

Standard Features

- 1 MB RAM
- 1.44 MB 3.5" Drive
- 40 MB 28 ms Drive (Laptop)
- 20 MB 28 ms Drive (Notebook)
- 640 x 400 VGA LCD Display
- 16 Shades of Gray (Laptop)
- 32 Shades of Gray (Notebook)
- 2 Serial, 1 Parallel (Laptop)
- 1 Serial, 1 Parallel (Notebook)
- 81-Key Low Profile Keyboard
- MS DOS 4.01
- Ni-Cd Battery (Laptop)
- 14.7/6.5 lbs (Laptop/Notebook)

Standard Features

- 30-Day Guarantee
- Unlimited Toll-Free Technical Support
- 1 Year GE On-Site Service in Most Locations
- Memory and Hard Drive Upgrades Available

BLACKSHIP
COMPUTER SYSTEMS, INC.

Call Blackship for all your system and networking needs.
We have a complete line-up of 286, 386, 386SX, 486, Laptops, and Notebooks.

2031 O'Toole Avenue • San Jose, CA 95131 Toll-Free Orders
Tel. 408-432-7500, Fax. 408-432-1443 **1-800-531-SHIP**

CIRCLE 909 ON READER SERVICE CARD

ANNOUNCING Computer Select™

The Most Complete Database of Computer Product Information Available



With COMPUTER SELECT you'll never again risk making the costly mistake of acquiring the wrong product. Now, using your own PC, you can identify, evaluate and select the best products that meet your requirements and your budget. Easy-to-use search software lets you quickly retrieve the documents you need from the vast database of product reviews, specifications, announcements and buyer's guides.

Discover the power of this new CD-ROM product. Call now for your free, no-obligation demo disk. Then, if you wish, you can subscribe for \$995.*

Get instant access to more than...

- 70,000 articles and abstracts each month
- Complete specs for 70,000 hardware, software and communications products
- Profiles of 12,000 companies, including addresses and phone numbers
- 9,000 definitions of computer and telecommunications terms.

COMPUTER LIBRARY™

One Park Avenue, New York, NY 10016

**CALL NOW FOR A FREE
DEMONSTRATION DISK
212-503-4400**

Computer Library and Computer Select are trademarks and Data Sources is a registered trademark of ZEN Communications Company. © 1991 ZEN Communications Company.

*U.S. and Canada only. Outside U.S. \$1,995.

WHITEFOX MICROSYSTEM 4-JUNIOR

AMI BIOS/MS-DOS 5.0/Windows 3.0/Mouse
14" Mono SVGA Monitor(1024x768)
Trident 8900 SVGA w/1MB RAM
Chinon 12 or 144MB Floppy Drive
Kakoi/Conner IDE Hard Drive w/Cache
Super IDE 16-Bit Controller
2S/1P/1G Ports, 101 Click Keyboard
200W Slim Desktop Case

2MB RAM(70ns), 43MB IDE(25ms, 8K)	
286-12/16/20MHz	\$995/1,015/1,035
386SX-16/20/25MHz	\$1,095/1,125/1,155
386DX-25/33/40MHz 64K	\$1,245/1,295/1,345
486SX-20/25MHz 64K	\$1,445/1,495
486DX-25/33MHz 64K	\$1,745/1,795
4MB RAM(70ns), 105MB IDE(19ms, 32K)	
386SX-16/20/25MHz	\$1,335/1,365/1,395
386DX-25/33/40MHz 64K	\$1,495/1,545/1,595
486SX-20/25MHz 64K	\$1,695/1,745
486DX-25/33MHz, 64K	\$1,945/1,995
4MB RAM(70ns), 210MB IDE(19ms, 32K) \$CALL	

WHITEFOX MICROSYSTEM STANDARD

AMI BIOS/MS-DOS 5.0/Windows 3.0/Mouse
14" N.I. Multisync Color(1024x768)
Tseng Lab ET4000 SVGA w/1MB RAM
Teac 12 & 144MB Floppy Drive
Maxtor IDE Hard Drive w/Cache
Super IDE 16-bit Controller
2S/1P/1G Ports, 131 Solar Keyboard
250W Tower Case, 2 Cooling Fans

4MB RAM(60ns), 130MB IDE(15ms, 64K)	
386SX-20/25MHz	\$1,745/1,795
386DX-33/40MHz 64K Cache	\$1,995/2,045
486SX-20/25MHz 64K	\$2,095/2,195
486DX-25/33MHz 64K	\$2,395/2,495
486-25/33MHz 256K 12-Slots	\$2,545/2,695
8MB RAM(60ns), 210MB IDE(16ms, 64K)	
386-33/40MHz 256K Cache	\$2,495/2,545
486SX-20/25MHz 256K	\$2,595/2,695
486-25/33MHz 256K	\$2,845/2,945
486-25/33MHz 256K 12-Slots	\$3,045/3,195
8MB RAM(60ns), 340MB IDE(15ms, 64K) \$CALL	

WHITEFOX MICROSYSTEM PREMIUM

AMI BIOS/MS-DOS 5.0/Windows 3.0/Mouse
15" N.I. Multisync Color(1024x768)
Western Digital SVGA(32768 Colors)
Teac 12 & 288MB Floppy Drive
Seagate SCSI Hard Drive w/Cache
Adaptec/UltraStor 32-bit SCSI
Ultra Tower Case, 131 Solar Keyboard
300W Built-in UPS, 3 Cooling Fans

4MB RAM(60ns), 170MB SCSI(15ms, 64K)	
EISA 386-25/33MHz 256K	\$3,595/3,695
EISA 486-25/33MHz 256K	\$4,095/4,295
486-25/33MHz 256K 12-Slots	\$3,495/3,695
8MB RAM(60ns), 330MB SCSI(15ms, 64K)	
486-33/50MHz 256K Cache	\$3,745/5,745
486-25/33MHz 256K 12-Slots	\$4,045/4,245
EISA 386-25/33MHz 256K	\$4,145/4,245
EISA 486-25/33MHz 256K	\$4,645/4,845
16MB RAM(60ns) 780MB SCSI(13ms, 64K)	
486-25/33MHz 512K 12-Slots	\$5,145/5,345
EISA 486-33/50MHz 512K	\$6,345/8,345



COMPUTER WORLD: 5624 N. BERNARD ST., CHICAGO, IL 60659 • ORDER (800) 458-3172 • INFO (312) 588-0058 • FAX (312) 588-8143

WHITEFOX MICROSTATION 4-JUNIOR

1MB RAM, 1.44MB Floppy Drive
14" Monochrome SVGA Monitor
Trident 9000 SVGA(1024x768) w/512K RAM
10 Mbps 16-bit Ethernet LAN Card
200W Slim Desktop Case
2S/1P/1G Ports, 101 Click Keyboard

286-16/20MHz	\$795/825
386SX-20/25MHz	\$1,045/1,095
486SX-20/25MHz, 64K	\$1,345/1,395

WHITEFOX MICROSTATION STANDARD

AMI BIOS/MS-DOS 5.0/Windows 3.0/Mouse
17" N.I. Flat Multisync Color Monitor
Ultra SVGA(1280x1024) w/2MB VRAM
32-bit 8MB RAM(60ns), 1.44MB Floppy
16-bit 10Mbps Ethernet Built-in
16/32-bit 330MB SCSI Hard Drive
2S/1P/1G Ports, 131 Solar Keyboard

ISA 486-33/50	\$4,695/6,795
EISA 486-33/50MHz 256K	\$5,945/8,645

WHITEFOX MICROSTATION PREMIUM

100% Sun SPARC Workstation Compatible
64K Cache, Mouse, Keyboard
Upgradable 25MHz SPARC, 18 MIPS
64-bit 8MB RAM thru MBUS 320MByte/s
1.44MB Floppy/210MB SCSI Hard Drive
3 Exp.Slot(32-bit SBUS, 100MByte/s)
2 Serial/Printer/Ethernet/Audio Port

17" N.I. Color System(1152x900)	\$8,475
20" N.I. Color System(1152x900)	\$8,975

CIRCLE 911 ON READER SERVICE CARD



EPSON LT-386SX LAPTOP

Retail \$3999
Sale price:

\$1499

EPSON® Full Factory Warranty!

LAPTOP ACCESSORIES

Extra 40MB removable	299
Epson laptop 2400 baud modem	149
2 MB memory upgrade	229.

EPSON PRINTERS

LX810	169.
LQ 570	269.
LQ 870	449
EPL 7000	849

COD, Visa, MasterCard, checks & cashiers checks accepted.

Texas residents add sales tax

INCLUDES:

- 16MHz 80386SX
- Removable 40MB hard drive
- "Paperwhite" VGA display
- 16 bit AT slot
- 2MB memory
- Ext. VGA connector
- Ext. 101 keyboard connector

TEXAS MICROCENTER

6726 Camp Bowie, Fort Worth, Texas 76116
(817) 731-0778 • FAX (817) 377-0917

1-800-262-5534

CIRCLE 912 ON READER SERVICE CARD



Computer Connection

Create Your Own System!

To order: 1-800-835-2714
Questions: 1-800-443-5222
2 Venture Lane • P.O. Box 3629
Sunriver, OR 97707

486
33 MHz 64K cache
\$899

386^{SX}
20 Megahertz
\$279

386
33 MHz 64K cache
\$469

386^{SX}
16 Megahertz
\$199

386
25 MHz
\$349

286
12 Megahertz
\$79

Prices above are for motherboards. Select options below.

CASES

Includes power supply	
Desk Top	\$114.95
Mini-size Tower	119.95
Mid-size Tower	134.95
Full-size Tower	159.95

MEMORY

1 MB RAM	\$ 59.95
4 MB RAM	189.95
256K Cache	119.95

KEYBOARDS

101Key Enhanced \$49.95

I/O CARDS

2Ser 1Par 1Game \$19.95

HARD DRIVES

40MB 28ms	\$169.95
80MB 17ms	299.95
120MB 18ms	399.95
213MB 15ms	599.95

FLOPPY DISKS

12 MB 5.25 inch	\$64.95
1.44 MB 3.5 inch	64.95

DISK CONTROLS

IDE Floppy & Hard \$19.95

MODEMS

Internal 2400 Baud \$59.95

External 2400 Baud 89.95

Fax Modem 119.95

MONITORS

*V. G. A. 14" 800x600 256K card 28 dot pitch	\$379.95
*Super V G A 14" 1024x 768 1MB 28 dot pitch	\$419.95

*Monochrome 14" Amber with card \$124.95

D.O.S.

Version 3.30	\$49.95
Version 4.01	55.95
Version 5.00	69.95

MOUSE

MS compatible \$36.95

All systems are 100% IBM Novell and Windows compatible. They are fully assembled and tested. Math Co-Processors available. F.C.C. approved. Mastercard, Visa card, Discover card and C.O.D. orders accepted.

Shipping and handling additional. Prices subject to change.

CIRCLE 913 ON READER SERVICE CARD



Ariel Design, Inc.

COMPUTER SOLUTIONS



UPGRADE!
to **AMI**
386/486
Cache

MOTHERBOARDS & SYSTEMS

- NEW!** AMI 386SX-20, 25 32Kb Cache, integrated I/O
- AMI MARK III 386-25 64Kb Cache, upgradeable-486
- NEW!** AMI MARK IV 386-33, 40 "Screamer" 64/256Kb write back Cache
- AMI MARK IV 486-33 "Screamer" 64/256Kb write back Cache
- NEW!** AMI Baby Voyager 486-33 64/256Kb write back Cache, integrated I/O
- NEW!** AMI EZ-Flex EISA 386-33 64/256Kb write back Cache, integrated I/O
- NEW!** AMI EZ-Flex EISA 486SX-20, integrated I/O
- NEW!** AMI EZ-Flex EISA 486-25, 33 64/128/256/512Kb wb Cache, integ I/O
- AMI 486-33 Enterprise II 128Kb Cache, 1-FDC
- AMI EISA/SCSI Host adaptor 80386SX-16 processor, 1/4/16MB Cache

Motherboards from the industry leader. 1 Year Limited Warranty.
Toll Free Tech support. Call for the best price. AMIDIAG \$78

45 Pond Street • Norwell • MA 02061
1-617-982-8800 • Fax: 1-617-982-9095

1-800-88Ariel

CIRCLE 914 ON READER SERVICE CARD

ROM BIOS UPGRADES

Upgrades For Your IBM or Compatible From the Largest BIOS Distributor in America!

The ROM BIOS upgrades support 360K, 720K, 1.2MB & 1.44MB floppy disk drives, complete set-up in ROM, EGA and VGA support, optional built-in diagnostics in ROM (AMI only), Novell and Netware compatible, supports up to 48 different types of hard drives plus two user defined, IDE drive support: 84, 101 & 102 key keyboard support, 100% IBM compatible, supports speeds up to 33 MHz; supports 0, 1 or 2 wait states, full OS/2 support; full Microsoft Windows support; complete documentation, latest versions available.

Upgrading a BIOS chip is relatively easy, even a person with no computer experience can do it. We provide full installation instructions. If you have a problem just call our Tech Support Line, we are always there to help, we have the experience, **we are the largest stocking BIOS distributor in America!**



UPGRADES ETC
A DIVISION OF THIMA TECHNOLOGIES

(800) 541-1943 WA
(800) 955-3527 CA

15251 NE 90TH STREET REDMOND, WA 98052
FAX: 206/881-8294
23930 CRAFTSMAN RD. CALABASAS, CA 91302
FAX: (818) 992-3365

VISA MasterCard C.O.D.

XT BIOS UPGRADES

AMI-XT BIOS	59.95
PHOENIX-XT BIOS	59.95
PHOENIX SPERRY XT BIOS	59.95
PHOENIX-TANDY 1000 BIOS	59.95
PHOENIX-KAYPRO PC-10 BIOS	59.95
PATERNON-TURBO XT BIOS	59.95

AT 286 BIOS UPGRADES

AMI-286 INTEL BIOS	79.95
AMI-286 CHIP & TECH BIOS	79.95
PHOENIX-286 INTEL BIOS	79.95
PHOENIX-286 AST BIOS	79.95
PHOENIX-COMPAQ 286 BIOS	79.95
PHOENIX-EPSON EQUITY III BIOS	79.95
PHOENIX-DTK 286 BIOS	79.95

AT 386 BIOS UPGRADES

AMI-386 INTEL BIOS	79.95
AMI-386 CHIP & TECH BIOS	79.95
AMI-386-SX INTEL BIOS	79.95
AMI-386-SX CHIP & TECH BIOS	79.95
PHOENIX-386 INTEL BIOS	79.95
PHOENIX-386 COMPAQ BIOS	79.95
PHOENIX-386 CHIP & TECH BIOS	79.95
PHOENIX-386-SX INTEL BIOS	79.95
PHOENIX-DTK 386 BIOS	79.95

IBM BIOS UPGRADES

PHOENIX-IBM PC BIOS	79.95
PHOENIX-IBM-XT BIOS	59.95
PHOENIX-IBM AT BIOS	89.95
AMI-IBM-PC BIOS	79.95
AMI-IBM-AT BIOS	89.95

KEYBOARD BIOS UPGRADES

AMI-286/386 KEYBOARD BIOS	34.95
PHOENIX-286/386 KEYBOARD BIOS	34.95

CIRCLE 916 ON READER SERVICE CARD

DISC DRIVES

Repair, Exchange, Sales

10% OFF REPAIR COUPON

10-19mb	55%	N.A.
20-29mb	75%	75
30-39mb	85%	89
40-49mb	105%	125
50-59mb	140%	175
60-69mb	175%	225
70-79mb	205%	255
80-89mb	255%	349
90-99mb	N.A.	395

Test & Evaluation 615

CLASS 100 CLEAN ROOM
10% DAY WARRANTY
3-7 DAY TURN-AROUND TIME

jb TECHNOLOGIES, INC.

LOWEST DISC DRIVE PRICES IN THE USA

MODEL	Capacity	Interface	Price	Price
Kalok 330	30mb-48mb	RL	5170	5200
Meiscribe 3650	43mb-48mb	MF	199	2
Seagate ST152A	44mb-48mb	DE	N.A.	194
Miniscribe 3675	64mb-68mb	RL	209	225
Microsc HH1090	80mb-20mb	MF	395	196
Buscine WGA-285	109mb-20mb	SC	395	424
Microsc HH1120	125mb-48mb	RL	439	439
Miniscribe 3380E	323mb-48mb	ES	N.A.	995

CIRCLE 915 ON READER SERVICE CARD

Free DOS Tips!

Call Toll free
1-800-223-8720 Ext. 726

* from The Cobb Group's newsletter
Inside DOS.

PRINTER & PERIPHERAL SHARING

DATA SHUTTLE

The Product Recommended for Performance, Compatibility & Reliability



Features:

- 68000 CPU
- processes 70,000 CPS
- serial baud rates from 300 to 115,200
- 8 bi-directional serial ports
- 4 configurable parallel ports
- up to 8 meg of ram
- completely programmable
- supports file transfers & daisy chaining
- suggested list \$899
- dealers invited

"Speed to spare. The Data Shuttle turned in excellent overall performance results on our timed performance tests."

"Installation is standard fare. Less experienced users will appreciate the step by step instructions in the manual along with the install program which handles much of the work."

GI INSTRUMENTS INC.

OVER 35 OTHER CONNECTIVITY PRODUCTS AVAILABLE
1-800-268-5156 U.S. 1-416-842-0200 CDN.

CIRCLE 917 ON READER SERVICE CARD

Poor printouts promote pure Panda-monium



Your printhead could be at fault: Puns aside, if your dot-matrix printouts are light, jagged or incomplete, you may need to refurbish or replace the printhead. Panda can save you money, and get your printer running like new. Over 400 types of printheads refurbished and many new in-stock! Call today.

Model	New Price	Repair	Model	New Price	Repair
Apple Imagewriter I	\$94.00	\$52.00	NEC 5200/5300	\$238.00	\$114.00
Apple Imagewriter II	94.00	69.00	NEC P6/P7	308.00	117.00
Epson LQ2550	249.00	129.00	Okidata 84/92/93	138.00	58.00
Epson LQ800/1000	218.00	129.00	Okidata 182/183/192/193	99.00	58.00
Epson LQ850/1050	210.00	129.00	Okidata 293	275.00	134.00
Epson LX 80/90	90.00	58.00	Panasonic 1080/1090	101.00	82.00
Epson MX/RX 100	77.00	58.00	Panasonic 1124	147.00	104.00
Epson MX/RX 80	74.00	58.00	Star NB 10/24	199.00	122.00
IBM Proprinter X24	407.00	129.00	Star NX 10	69.00	54.00
IBM Proprinter	99.00	69.00	Toshiba 351	424.00	140.00

Recharge inkjet or
bubble jet cartridges
JetFill 2-pack
\$16.95



Panda
Printer Products

Call 24 hours a day for more info
(800) 580-3232



Ordering Info: Warranty, refurbishments & months new - 90 days. Governmental & Educational POs accepted. Prices subject to change. Texas residents add 8% sales tax.

2324 Ridgpoint Dr., #A • Austin, TX 78754 • (512) 832-9385

CIRCLE 918 ON READER SERVICE CARD



9-Track Solutions for Today's PC Desktop

Come to Overland Data for modern PC 9-track solutions:

- Space-saving, low weight 1600 bpi subsystems with durability backed by a two year warranty.
- High capacity 6250 bpi subsystems with speed to match
- The latest software for data interchange and backup, with a friendly, intuitive interface
- OSSP, the most comprehensive customer support program in 9-track. It's the best insurance for your investment.

We bring you state-of-the-art 9-track solutions for today's PC desktop. Because for the modern PC user, nothing less will do.



OVERLAND DATA. 1-800-PC9-TRAK

San Diego, CA
1-800-729-8725 • Bus. Phone: 1-619-571-5555 • FAX 1-619-571-0982

CIRCLE 920 ON READER SERVICE CARD



*"The clear winner among half-inch
nine-track tape back-up devices"*

PC Magazine

NineTrack Tape Sub-Systems

New high-performance, easy-to-install software make the NineTrack even faster and easy to use. NineTrack gives you the power to read and write to 9-track tape with your IBM PC XT/AT/386/486 PS/2 and compatibles. Exchange data with other PCs, minis and mainframes. 1600/3200/6250 BPI systems are available.

- New software features:
- Data transfer rate of 1MB per second for PC bus
 - Full menu support or execute commands from DOS prompt or batch files
 - Expert Support System
 - Hard disk back-up utilities

Call us today. 800-828-0599 216-349-8600



Computer Logics
31200 Carter Street
Cleveland, OH 44139
Fax 216-349-8620

CIRCLE 921 ON READER SERVICE CARD



**Faxes On
Your Laser
Printer!**

**PC Fax
Without
Boards!**

JetFax II provides:

- Plain Paper Quality.** JetFax delivers faxes on plain bond paper at your laser printer, fast.
- Easy PC Faxing.** Send PC files as faxes from within your application *without internal fax boards.*
- Simple Network Faxing.** JetFax provides low-cost, hassle-free network faxing.
- Easy Windows Faxing.** Anything you can print from Windows, you can fax.

CALL TODAY! Wilco AMS
1-800-U LINK IT
or (408) 746-3993

JetFax II

CIRCLE 919 ON READER SERVICE CARD

3480 - 9TRACK FOR PCS AND WORKSTATIONS DOS • SUN • MAC • UNIX • XENIX • RS/6000 TAPE DUPLICATOR SYSTEMS

MANUAL/AUTOLOAD DRIVES 50/125 IPS
SCSI/PERTEC 800/1600/3200/6250



GSA SCHEDULE

- TAPE DRIVE RENTALS
- CONVERSION SERVICES

1-800-362-6250

FAX: 301-309-8355
Rockville, Md

**INTERFACE
SYSTEMS
INC.**

CIRCLE 922 ON READER SERVICE CARD

9 TRACK TAPE DRIVES 3480 TAPE DRIVES FOR PC/XT/AT/386/486/PS2

LOWEST
PRICES
BEST
QUALITY



LAGUNA DATA SYSTEMS

26941 Cabot Road
Suite 131
Laguna Hills, CA 92653-7007



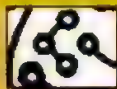
(800) 886-4827
(714) 367 0497 TE1.
(714) 367 0508 FAX

CIRCLE 923 ON READER SERVICE CARD

Raster-to-Vector Conversion Software

Scan into CAD and most other drawing programs!

Before ENVISION IT
Conversion TIFF
(raster file)



After ENVISION IT
Conversion DXF
(vector file)

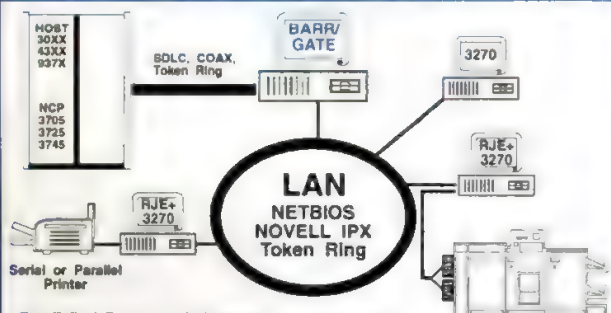


1-800-321-ENVY (3689)
30-Day, 100% Money Back Guarantee!

\$299 ENVISION IT software (retail \$399)
\$399 ENVISION IT bundled with Marstek's
Mars 105 Plus hand-held scanner (retail \$596)

CIRCLE 924 ON READER SERVICE CARD

Powerful LAN-to-Mainframe Solution: BARR/GATE



BARR/GATE delivers maximum performance with the complete LAN-to-mainframe communications solution.

BARR/GATE combines high-speed RJE (up to 384,000 bps) and 3270 in one integrated product. And it supports up to 254 simultaneous LUs. PC workstations are capable of multiple 3270 sessions. Options include: RJE (featuring print spooling with printing speeds up to 20,000 lines-per-minute), tape drive support, and S/370 channel-attached printer support.

The Barr gateway solution will reduce your costs and boost your productivity. Call Barr Systems today for a 30-day evaluation.

More Speed • More Features • More Solutions



Barr Systems, Inc.
800-BARR-SYS • 800-227-7797 • FAX 904-371-3018

CIRCLE 925 ON READER SERVICE CARD

Step Aside, CompuServe!



Run your own business BBS on any PC compatible. Log in through COM1/2/3/4 modems or your Novell network and:

- Provide online ordering facilities
- Share databases, public messages and files
- Exchange private messages/files via E-mail
- Offer customers round the clock support
- Conduct unattended market research
- Hold online seminars and conferences

Call (305) 583-5990 now to order your \$59 starter package!

GALACTICOMM

AMIDTAG

ADVANCED DIAGNOSTIC UTILITY



August 1990
AMIDTAG Version 3.34

\$89.95
List Price

286/386/486
Compatible

"...the most comprehensive package that delivered the most accurate results in the shortest time..."
PC Magazine, August, 1990

Complete Diagnostics for:

- Memory
- Hard Disk
- Floppy Disk
- Keyboard
- Video
- Ports

WORLDWIDE DISTRIBUTORS

SienerSoft

6540 Lusk Blvd. Suite C-166, San Diego, CA 92121 USA
DEALER INQUIRIES WELCOME 1-800-755-1875

CIRCLE 926 ON READER SERVICE CARD

EARN YOUR COLLEGE DEGREE AT HOME

B.S. & M.S. In Computer Science

Get the opportunity and earning power a college degree confers—without leaving home and without spending thousands of dollars.

- Approved for tuition reimbursement by leading corporations
- ALL COURSES BY CORRESPONDENCE
- Most courses interactive
- Approved Ada course available
- Qualified instructors available on telephone help lines



Phone: 1-205-323-6191 • FAX: 1-205-328-2229
2101 PCX Magnolia Ave. • Suite 200 • B'ham, AL 35205

The leading edge of learning

CIRCLE 927 ON READER SERVICE CARD

BrainMaker
Neural Networks
Give your PC
human skills.



"BrainMaker is the
most fascinating
computer software
I've ever seen."
John Dvorak
PC Magazine

Find patterns and hidden relationships in data and learn from the past. Read in data from Lotus, dBase, Excel, binary, and ASCII. Menus, dialog boxes, color, mouse support, great manuals. Stock and bond forecasting, pattern recognition, commodities, futures, and more.

Mac version now available

30 day money back guarantee!

BrainMaker is \$195 Professional is \$795
Free Catalog: 800/284-8112, 916/477-7481
California Scientific Software

CIRCLE 928 ON READER SERVICE CARD

Loan Amortization Software

A favorite of banks & atty's worldwide!

Over 5000 sold!

- ✓ Creative Financing
- ✓ Amortization Schedules
- ✓ Replace Financial Calculators
- ✓ Change variables instantly
- ✓ Exec-Amort™ \$149.95
- ✓ Mini-Amort™ \$79.95
- ✓ 5 user Network Version: \$450.00
- ✓ Order Today Call 800-284-8112
- ✓ Fax Order: 916-477-7481
- ✓ California Scientific Software



✓ Easy Amortization Schedules

✓ Replace Financial Calculators

✓ Change variables instantly

Exec-Amort™ \$149.95

Mini-Amort™ \$79.95

5 user Network Version: \$450.00

Order Today Call 800-284-8112

Fax Order: 916-477-7481

California Scientific Software

CIRCLE 929 ON READER SERVICE CARD

ANNOUNCING



Version 7.0

- Full Color Support
- Network Support
- Global search & replace
- 3D Charting
- Over 270 output devices supported

DON'T buy any flowcharting product until you test drive EasyFlow. Unprecedented support for Desktop Publishing & Graphics packages, Alternate Shape Libraries, FREE tech support and a NO RISK 30 Day Money Back Guarantee all combine to make EasyFlow the industry leader and corporate standard.

Vendor Direct List Price

\$280

Plus Shipping

HavenTree Software Limited
P.O. Box 1093-P
Thousand Island Park, NY 13692
Telephone: (613) 544-6035 Ext. 49
Fax: (613) 544-9632



ORDER HOTLINE 1-800-267-0668

CIRCLE 930 ON READER SERVICE CARD

SIMPLY THE HIGHEST QUALITY
IMAGES ANYWHERE

Rad
Graphics

Special Holiday Prices
Limited Time Offer
800x600x256 PCX Images

- Makes a great gift
- Dazzle your friends
- Works with your favorite word processor, publishing or graphics application
- Use as Windows Wallpaper
- DOS & Windows viewers included
- Windows users convert files to BMP, GIF, IMG, PIC, TIFF and WPG
- Over 5MB in every volume
- Comes on 5 high density disks
- Hard drive not required



- #901 Mother Earth
Breathtaking views of oceans, islands, volcanoes & sunsets
- #902 Space Things
Stunning images of planets, galaxies, satellites & the stars
- #903 Amazing Animals
An educational look at mysterious animals around the world
- #900 Graphix Starter Kit - Included with every order - \$10
A collection of DOS and Windows utilities with Preview Images

Add \$3 for S&H

Add \$3 for Foreign

Add \$3 for 3.5" disks

FL add 6% sales tax

Send check or money order

Starware Publishing Corp.
P.O. Box 4188, Dept. 50
Deerfield Beach, FL 33442
For more information call
(305) 426-4552

One Volume = \$29.88

Two Volumes = \$44.88

Three Volumes = \$59.88

24 hour / 7 days

To order call

800-354-5353

US and Canada

CIRCLE 931 ON READER SERVICE CARD

Graphic™ **Publication Quality Scientific Graphics**

- Linear, log, polar plots
- Shaded contour 3-D plots
- Export PC, EM, HPGL, TIFF files
- Search mode for functions
- 2D, 3D, 4D, 5D, 6D, 7D, 8D, 9D
- Simulation plots
- Quick Plotting, print, EPS
- High resolution Tektronix format
- Supports most picture, plotter and printer cards
- 286 Enhanced version available

"All of the C language routines you need to write an impressive scientific graphing program of your own Highly Recommended"

PC Magazine

Solar-Mic Endeavors

508 North Kentucky St.
Kingston, TN 37763

CIRCLE 932 ON READER SERVICE CARD

CAPTURE YOUR SCREEN!

1-800-284-2574

Print any screen on your dot matrix, laser or inkjet printer. An immediate hard copy at the touch of a key. Only \$59.95

- Supports Windows 3.0
- 256 Color Support
- Clips Graphics
- Saves PCX / TIFF Files
- Linkable / OEM Version

JEWELL TECHNOLOGIES, INC.

(206) 285-6860 FAX (206) 285-7340
130 Nickerson St., Suite 105, Seattle, WA 98109



TURN YOUR PRINTER INTO A PEN PLOTTER

FPLLOT™ lets you use your printer as a pen plotter. You get fast, high resolution plots with FPLLOT. If you use a CAD or graphics program, you can use FPLLOT to produce your plots with the full capabilities of your printer.

- Supports most dot matrix, laser, and ink jet printers
- High resolution output, no jagged lines
- Faster than pen plotters or most laser built-in and cartridge emulations
- Screen preview with zoom and pan
- Supports background plotting
- Device driver mode plots from inside your graphics program
- Stand-alone mode for fastest plotting
- Plot multiple plots with a single command
- Lets you control line thickness
- Full color plotting support
- Plot large plots on wide carriage printers, or as a mosaic
- Compatible with most CAD and graphics programs
- 100% emulation of the HP 7475A pen plotter

List Price
\$119.00
• S&H 3.00

FPLLOT CORP.

CIRCLE 834 ON READER SERVICE CARD

Beat the Bible Study Blues... only \$69.95 ea

Looking for a better way to study the Bible? BibleSource is modular, has instant searches, and you can build your own customized Bible study library. Modules include NIV, KJV, NIV Study Bible Notes and more! Save up to \$60 off retail prices! **60-day money-back guarantee!** BibleSource - available now at your local Christian bookstore...

1-800-727-7759

Zondervan Publishing House
Software and Electronic Products

Offer expires 12/31/91

CIRCLE 937 ON READER SERVICE CARD

Slides From Your PC Try Us FREE!

We want your business. And we'll prove it! We offer the best service available. Experts in Harvard, Freelance, Corel and others on staff to serve you. Free Federal Express shipping. Toll-free Customer Service. And if you should make a mistake, we'll reshoot your slides, free. Call today, and say "I'd like to try your service. Free."

1-800-222-2592



Accent Presentations, Inc.

12780 High Bluff Drive, Ste. 250 • San Diego, CA 92130

Need more room on your hard disk?

Doesn't everybody?!!

Increase your disk space 2-3 times, on-the-fly, with the fastest, most advanced PC data compression product!

Call 1-800-732-3133 to order, or for more information on the dealer nearest you.

- FASTEST compression solution available.
- No artificial DOS commands.
- Easiest installation and use.
- Completely safe and transparent.
- Reduces the number of floppies required for backup by 50% or more.
- Disk Defragmentation program included free (a \$50 value).



AddStor

AddStor, Inc.
3905 Bohannon Drive
Menlo Park, CA 94025
1-800-732-3133

CIRCLE 836 ON READER SERVICE CARD

Cakewalk Apprentice™

For IBM PCs

MIDI STARTER KIT

Put a recording studio in your PC!

Create, edit and play back your own multi-track songs using any MIDI instrument. Also works with Sound Blaster™.



Starter Kit includes: Cakewalk Apprentice MIDI sequencer software; MIDI interface card; 1 pr. 10 ft. MIDI cables; Load-and-play song files and drum patterns also available.

Full-function demo disk for \$10 (works with PC speaker)

To order or for more information, call
800-234-1171 or 617-273-4437.

Twelve Tone
SYSTEMS

Only \$199.

P.O. Box 760 Watertown, MA 02272

CIRCLE 835 ON READER SERVICE CARD

HyperBible™ for Windows™

Make your Bible Study Fast, Easy and FUN!

The popular Thompson Chain-Reference® Bible comes alive with:

- Over 100,000 topical notes • Outline studies • Atlas • Placemarks
- Character studies • Archaeology info • "Hypertext" interface
- Easy Word Processing interface • Powerful word/concept searches
- NIV or King James • 30 day money back guarantee!
- \$199 sug. retail includes everything! (+ \$5 S&H)

Only \$129 with this ad until 12/15/91!

"...truly impressed with the 'turbo charged' feeling..."

Christian Computing 3/91

Call toll free to order now! Visa or M/C!

1-800-777-1841

PO Box 49788-Z Colo. Spgs., CO 80949



CIRCLE 935 ON READER SERVICE CARD

DON'T BE BLUE.

Don't think you can't afford to target over 800,000 PC buyers here in color. You can.

Call 1-800-825-4237

The
Ultimate
386/486
memory
manager!

\$99.95

Order
Now

1-800
662-8266

Memory Commander

Memory Control
for 386 and 486 PCs

Breaks the
640K Barrier

The only way to get
900K of contiguous DOS

Memory Commander

The only 900K memory manager! No other memory manager comes close. Expands contiguous available MS-DOS 5.0 memory up to 901K for VGA text applications. Memory management of all your extended RAM memory. Automatically loads TSRs & device drivers high. Quickest & easiest install. Windows 3.0 & MS-DOS 5.0 compatible.



V Communications Incorporated

4320 Stevens Creek Blvd Suite 275-PC

San Jose CA 95129

408.296.4224

DOS MASTERY OVERNIGHT... GUARANTEED!



Q-DOS 3:

Still ... the
Fastest Way to
Easily Manage
Your Hard Disk's
Files and
Subdirectories!



Who Needs Q-DOS 3?

- Anyone who wants to immediately manage their files and directories without so much as consulting a manual.
- Anyone who wants to be more organized and productive.
- Anyone who would like to simplify their life by avoiding lengthy DOS syntax, yet obtain enough power to satisfy any DOS "pro."
- Anyone who would like unlimited toll-free customer support and a 60-day money-back guarantee for ultimate peace of mind.

GAZELLE

Call for the dealer nearest you:
800-RUN-FAST

Gazelle Systems, Inc. • 45 North 500 West • Provo, Utah 84601 • (801) 477-1288

CIRCLE 939 ON READER SERVICE CARD

WINDOWS

**FREE
TIPS!**

Inside
MICROSOFT WINDOWS

Reducing Program Manager's impact on

system resources

Inside Microsoft

Windows is full of tips and techniques to help you use Windows more productively. ♦ *Inside Microsoft Windows* provides practical "how-to's" and timesaving shortcuts you can use immediately. ♦ *Inside Microsoft Windows* is from The Cobb Group, the nation's leading publisher of software-specific journals.

Call for your **FREE ISSUE** today!

1-800-223-8720

Ext. 1001

KeySkin™ Keyboard Protectors and Dust Covers

From the World's Leader in Computer Protection



Quality - Selection - Service - Fast Delivery

CompuCover Inc.

2104 Lewis Turner Blvd.

Fort Walton Beach, FL 32547

Order Line (800) 874-6391

Service (904) 862-4448

Fax (904) 863-2200

CIRCLE 940 ON READER SERVICE CARD

LABEL MASTER

Print Perfect Labels and Forms In-House On Almost Any Printer

- WYSIWYG layout • Money back guarantee
- Supports matrix, laser, thermal printers
- Supports most bar codes and text fonts
- Supports graphics images
- Label Master \$479 • Quick Draw \$259
- Developers library with source \$389

THE COMPUTER CONNECTION

P.O. Box 634 • Eau Claire, WI 54702

715/833-2331 • Fax 715/834-1995

(800) 552-2331



CIRCLE 941 ON READER SERVICE CARD

PC CLASSIFIED

HARDWARE/ADD-IN-BOARDS

COMPUTER SYSTEMS

MEMORY UPGRADES		ROBOFAX SHOPPING MALL Open 24 hours Call 800-424-3299 Have your fax # ready. Follow voice instructions.
COMPUTERS	FAX MODEMS	
APPLE, AST, AT&T, COMPAQ, DATA GENERAL, DEC, EPSON, EVEREX, IBM, HEWLETT PACKARD, NEC, PANASONIC, SILICON GRAPHICS, SHARP, SUN, TEXAS INSTRUMENTS, TOSHIBA, ZENITH	COMPAQ MAXFAX9624LT-C 9600bps/2400bps/Group III IBM & Compatible MAXFAX9624 9600bps/2400bps/Group III MAXLITE/PC (Portable) 9600bps/2400bps/Group III	
NOTEBOOK MEMORY	TOSHIBA MAXFAX9624LT-T 9600bps/2400bps/Group III	
COMPAQ, TOSHIBA, ZENITH	PRINTER MEMORY	
SIMMS SIPPS	Apple, Canon, Epson, HP, IBM, Okidata, Panasonic...	
1MB x 8, 4MB x 8, 70ns & 80ns 1MB x 9, 4MB x 9, 70ns & 80ns		

ADD-ON AMERICA
Toll Free 800-292-7771
433 N. Mathilda Avenue, Sunnyvale, CA 94086
TEL (408) 746-1590 FAX (408) 746-1593

LOWEST COMPONENT PRICES

486 DX 33 MHz 64K cache 0K	\$879.00
386 DX 40 MHz 64K cache 0K	\$490.00
386 DX 33 MHz 64K cache 0K	\$459.00
386 DX 25 MHz 0K	\$349.00
MEMORY (PER MEG.)	\$44.00
DIAMOND SPEEDSTAR 1/MB	\$185.00

WE ARE THE WHOLESALE COMPONENT SOURCE FOR RESPELLERS, CONSULTANTS AND MANY FACTURERS OF COMPATIBLE SYSTEMS. WE OFFER HIGH QUALITY MOTHERBOARDS, CASES, MEMORY, DRIVES, VIDEO CARDS, NETWORK COMPONENTS AND ACCESSORIES.

CALL FOR UP-TO-DATE PRICING QUANTITIES DISCOUNTS
FI Associates, Pleasant Hill, CA
PHONE: (510) 827-5447
FAX: (510) 827-5547

CIRCLE 551 ON READER SERVICE CARD

CD-ROM

CD-ROM / WORM / ERASABLE

Multi-Media Products
LAN Support
OS/2, Unix, Xenix Support
Computers, Peripherals, Accessories

386 notebook "Virtual Office".....\$3,500
CD-ROM drives from.....\$499
NEC CDR-36 15 disc bundle.....\$999

QSA# GS00K90AG55317
call for free catalog
1-800-MEGABYTE
Phone: 800-292-0048
Fax: 800-292-0057

CDP
Compact Disk Products
272 Route 34, Aberdeen, NJ 07447

CIRCLE 552 ON READER SERVICE CARD

REMOTE ACCESS

Office & Home Computers
Network Servers • Remote Booting

Call for details or to schedule a demonstration. We will show you how to use our Remote Access software to control your computer from anywhere in the world. This is a revolutionary new way to use your computer. It allows you to control your computer from anywhere in the world. This is a revolutionary new way to use your computer. It allows you to control your computer from anywhere in the world.

1-800-266-1733 ext. 140
TEL 818-706-1733 FAX 818-706-2643

CIRCLE 553 ON READER SERVICE CARD

COMPUTER SYSTEMS

SAVE SAVE SAVE SAVE SAVE SAVE
LAPTOP SPECIALS
AND LOW, LOW PRICING

LATEST LAPTOP & NOTEBOOK MODELS
TOSHIBA • EVEREX • ZENITH • ALR
BONDWELL • SHARP • TI • SANYO
AST • ALTIMA • AT&T • SAMSUNG
PACKARD BELL • PANASONIC

Call for Availability Of Other Models

Computer Options
UNLIMITED
12 Maiden Lane, Bound Brook, NJ 08805
OPEN MON-FRI 9AM-5PM SAT 9AM-5PM EST
TO ORDER: 1-800-424-7678
Need Help? 908-469-7678
Buy With Confidence From The Laptop Specialists

CIRCLE 554 ON READER SERVICE CARD

486-33 MHz CACHE

Since 1985, MSE has been dedicated to bringing you high-quality American designed, engineered and built computer systems for a wide range of applications. NOW, for our 7th year anniversary special, we are proud to introduce our fastest and most powerful machine, the 80486-25MHz or 33MHz.

MicroCache 386-33MHz \$1095

- 80386-33MHz CPU
- 125MB Fast Dr. (15ms)
- Enhanced Keyboard
- 385-33MHz CACHE Controller
- 1.2MB Floppy Dr.
- 64K Cache
- 4MB RAM, expands to 32MB
- 2 Serial Parallel
- 40MHz Add \$50

MicroCache 486-33MHz

- 80486-33CPU 4MB RAM
- 1 2MB Floppy Dr.
- 210MB Fast Dr. (15ms)
- 64K Cache
- Enhanced Keyboard
- 150 MHz Landmark

\$1595

MicroCache 486 EISA-33MHz

- Intel Chip Set 4MB RAM
- 1 2MB Floppy Dr.
- 340MB Hard Disk Dr. (13ms)
- 128K Cache, expandable to 256K
- Enhanced Keyboard
- 32-bit EISA slot x 6

\$2595



Motherboard Special

- 386SX-16MHz W 1MB RAM \$299
- 386SX-25MHz W 2MB RAM \$399
- 386-33MHz W 64K Cache 4MB RAM \$599
- 486-33MHz W 8K Cache 4MB RAM \$849
- 486-33MHz W 64K Cache 4MB RAM \$999
- 486 EISA-33MHz W 128K Cache 4MB RAM \$1499

Expansion Options

- Nano 90801 Monitor 16" \$1049
- ATI Graphics Ultra \$499
- Sony 1304 HG Monitor 14" \$579
- Novel NE 1000 KII \$129
- SVGA (1024 x 768) Monitor 14" \$299
- Taeg Labs SVGA Card 1MB \$99
- Orchid Pro Designer II 1MB \$199
- NEC Seiko Hitachi 20" Monitor \$899
- Orchid Fahrenheit 1280 1MB V-RAM \$299

SALES HOURS:

Monday - Friday
9:00 AM - 5:30 PM
Saturday
10:00 AM - 3:00 PM
PST

MS ENGINEERING, INC.

10601 S. De Anza Blvd., Suite 214
Cupertino, CA 95014
(408) 257-4249 FAX: (408) 257-4398

CIRCLE 555 ON READER SERVICE CARD

FTI Design House Offers Low Price & High Quality Motherboard & System Products **FTI**

Do you need to upgrade your XT system? May be it is the time to buy a new computer! Please call Flash Technology (Toll Free) to ask what we can offer!

Why Pay Retail! 1-800-448-2031 P.O., COD, VISA & M/C Accepted

Motherboard:	BaseBare System:	Complete System:
286/12MHz \$85	- Motherboard	286/12-486/33 systems
286/16MHz \$105	- Memory	prices range from : \$690
386SX/16MHz \$210	- Case/Power Supply	to \$2380. Call for details.
386SX/20 32K Cache \$300	Low Low Prices !!	Low prices for Notebook !
386DX/25MHz \$390		
386/33 64K Cache \$500	1Mx9-80 SIMM : \$45	
386/40 64K cache \$550	Serial Mouse : \$15	
486/25 64K Cache \$910	DOS 5.0 Full Version: \$60	
486/33 256K Cache \$990	MS Mouse/Windows 3.0:\$70	
486/33 256K EISA \$1750	101 Keyboard : \$35	
	& others !!	

30 day money-back
1 year parts warranty
5 year labor warranty
Life time toll-free
technical support
No surcharge for card

FLASH TECHNOLOGY INC. 55 W Hoover Ave, Mesa AZ 85210 (Fax:602-464-9856)

CIRCLE 556 ON READER SERVICE CARD

Compu-Graphics

"The Desktop Publishing Specialists"

1-800-456-3877

- 386sx/16MHz only \$1049
- 386/25MHz only \$1269
- 486/25MHz only \$1975

Be sure to ask about our Desktop Publishing software and accessories. Many titles. Packages available

- 286/12MHz only \$899
- 1MB of RAM- expandable.
- 40MB, 28ms IDE hard drive.
- 1.2 or 1.44MB floppy.
- 14" VGA color monitor.
- 8 expansion slots.
- 200w power supply.
- One year warranty!
- Call for custom configurations.

CIRCLE 557 ON READER SERVICE CARD

Did you know...

On average, PC Magazine's direct market purchasers have spent-

- \$30,000 on hardware
- \$5,400 on software
- \$2,100 on accessories
- an average of \$2,855 per order

PC Magazine is exclusively read by over 800,000+ business buyers and brand specifiers, including computer resellers and consultants.

Calling about an ad? Say you saw it in
PC Magazine Classified

COMPUTER SYSTEMS

AMI 386/486 ISA & EISA CACHE MOTHERBOARDS

6/3/91 PC WEEK pg. 113 proved AMI is the BEST! We are the largest AMI reseller! Best price guaranteed!

PC WEEK Rated Cyrix #1 80387-25 \$179, 80387-33 \$199

Relisys 9514 Super VGA 14" Monitor 1024 x 768 28 W/Orchid ProDesigner II Bundle Only \$429 While they last!

Maxtor, Microscience & Micropolis Drive Bundles
120 MB IDE Adapter \$399 / 340 MB ESDI W/Ultrastor 12F \$1199

PC PROS 708/810-1010 FAX 9490
8205 S. Cass Ave., Darien, IL 60559

CIRCLE 558 ON READER SERVICE CARD

Classified Advertising Information on (800) 825-4237

DISKETTES

FORMATTED DISKETTES BASF, VERBATIM, SONY

WITH FORMAT	QTY 250 MIX & MATCH	WITHOUT FORMAT
\$ 44	5 25" DS DD	\$ 49
\$ 66	5 25" DS HD	\$ 66
\$ 63	3 50" DS DD	\$ 63
\$ 90	3 50" DS HD	\$ 99

- FREE FORMATTING on First Order
- TYVEC SLEEVES & Labels Included
- COLORED MEDIA Please Add \$ 05
- PRIVATE LABELING Available
- SAME DAY Shipping
- MONEY BACK GUARANTEE

800-255-3142

Diversified Systems Group, Inc.
PO Box 1114, Issaquah WA 98027

CIRCLE 563 ON READER SERVICE CARD

DISKETTES

BASF ♦ SONY ♦ VERBATIM

5 1/4" DS/DD 35¢

Formatted 39¢

5 1/4" DS/HD 46¢

Formatted 73¢

QD 300XLP 1/4" Tape Cart. \$15.50

QD 600A \$16.80

QD 6150 \$17.60

QD 6250 \$21.40

QD 6525 \$25.00

QD 2040 \$12.60

QD 2080 \$14.40

QD 2120 \$16.00

3 1/2" DS/DD 53¢

Formatted 67¢

3 1/2" DS/HD 89¢

Formatted \$1.16

- Colors Available
- Sleeves & Labels Included
- VISA, MasterCard, & POs Accepted
- 100% Certified with Lifetime Warranty

MEGAsoft

(800) 222-0490

FAX (908) 462-5656

PO Box 6609, Trenton, NJ 07728

Unlabeled Bulk, \$3 Handling Fee/Order + Freight Price/disk in lots of 300. Mix & Match any format/size. Tape price in bulk packs of 10

CIRCLE 559 ON READER SERVICE CARD

DATA CARTRIDGES BASF • SONY

TAPE & SIZE	QUANTITY
DC 2000 (40MB)	14.25 13.75 13.50
DC 2080 (80MB)	17.00 16.50 16.25
DC 2120 (120MB)	19.50 19.00 18.75
DC 300XLP (45MB)	18.00 17.50 17.25
DC 600A (60MB)	19.50 18.75 18.25
DC 6150 (150MB)	20.75 20.00 19.50
DC 6250 (250MB)	25.50 24.75 24.00

- 25+ PRICING on First Order
- SAME DAY Shipping
- MONEY BACK GUARANTEE

800-255-3142

Diversified Systems Group, Inc.
PO Box 1114, Issaquah WA 98027

CIRCLE 564 ON READER SERVICE CARD

BUY A BETTER BULK DISKETTE

NAME BRAND BULK	100 QTY.
VERBATIM 5.25 DS/DD	.28¢
5.25 HD	.52¢
SONY 3.5 DS/DD	.50¢
3.5 HD	\$1.09

GENERIC 5.25 DS/DD .24¢
5.25 HD .38¢
100% GUARANTEED 3.5 DS/DD .39¢
3.5 HD .79¢

800-356-2553

media source

FAX (404) 952-1432

CIRCLE 560 ON READER SERVICE CARD

BEST PRICES IN THE WORLD

DISKETTES W/LABELS ATTACHED

19¢ ea.	5 1/4" DS/DD 360K with sleeves & tabs / in lots of 100
29¢ ea.	5 1/4" DS/HD 1.2 MB with sleeves & tabs / in lots of 100
29¢ ea.	3 1/2" DS/DD 720K with labels attached / in lots of 100
49¢ ea.	3 1/2" DS/HD 1.44 MB with labels attached / in lots of 100

Delmonico's Direct To You!

6505 Cecilia Circle, Minneapolis, MN 55439

1-800-289-6561

CIRCLE 561 ON READER SERVICE CARD

Calling about an ad?

Say you saw it in

PC Magazine Classified

EXPANSION UNITS

TERABYTE INTL

MOTHER BOARD	
386-33/44 CACHE/1MB	\$ 585.00
386-25/44 CACHE/1MB	\$ 515.00
386-25/44 CACHE/1MB	\$ 435.00
486-33/720K CACHE/1MB EXPANDABLE TO 32MB	\$1350.00
PARADISE 386/44 256K VGA	\$ 75
TRIDENT 386/44 1MB VGA	\$105
NEAL WOODS	\$ 75
AT/486 PS-2 COM "10 COM 4	\$ 19
GAME CARD (QUAKE PORT)	\$ 13
PRINT CARD (PRINT PORT)	\$ 11
AT/IDE HDH CONTROLLER & CABLE	\$ 10
REMOVABLE HARD DISK DRIVE PAK	\$105
FOR SECURITY DIFFERENT DISK DATA SHARING	\$ 85
FULL SUT CASE & 200W PS 135 x 135 x 135	\$105
MED TOWER CASE & 200W PS 135 x 135 x 135	\$105
H/H MAC ENCLOSURE & 200W PS	\$105
IBM PS/2 MEMORY D-RAM/SIMM/SIPP	
1MB 6452003 \$ 65.00	1 MEG+ 80 \$ 4.90
2MB 6452004 \$ 120.00	256Kx4 80 \$ 5.25
AST MEMORY	1 MEG+ 80 SIMM \$14.00
4MB 50C740 004 \$135.00	1 MEG+ 80 SIMM \$14.00
1MB 50C740 003 \$ 71.00	256Kx4 80 SIMM \$14.00
4MB 50C740 004 \$135.00	1 MEG+ 80 SIMM \$14.00
CALL FOR MORE	
ORDER 800-688-BYTE	
TERABYTE INTL INC.	
20710 MANHATTAN PLACE #116 TORRANCE CA 90501	
TEL 213 787 9736 FAX 213 787 9735	
PRICE SUBJECT TO CHANGE WITHOUT NOTICE	

CIRCLE 565 ON READER SERVICE CARD

ICs PROMPT DELIVERY!!!

Memory for almost ALL computers	
DYNAMIC RAM	
4M Board for hp LJ & w/2MB	\$125.00
SIMM 4MBx8 80 ns	165.00
SIMM 16MBx8 60 ns	57.00
SIMM 16MBx8 80 ns	45.00
4 Mbit 4MBx1 80 ns	25.00
1 Mbit 1MBx1 80 ns	32.00
41256 8580Kx1 100 ns	1.75
41256 3580Kx1 120 ns	1.50
44256 2580Kx4 80 ns	5.40
4464 568Kx4 100 ns	1.75
EPROM	
27C4001 512Kx8 150 ns	\$28.00
D28F010 128Kx8 150 ns	24.00
27C1000 128Kx8 150 ns	10.00
27C512 64Kx8 120 ns	6.95
27128 16Kx8 250 ns	3.40
STATIC RAM	
1 Mbit 128Kx8 150 ns	\$13.00
62256LP 32Kx8 100 ns	5.90
OPEN 6-10 DAYS. 7-10 AM & 5-8 PM SHIP VIA FEDEX ON SAT	
SAT DEL ON FRIDAY ORDERS	
MICROPROCESSORS UNLIMITED INC	
24000 S. Peoria Ave	
Mesa, AZ 85205	
(918) 267-4961	
No minimum order. 1.00 shipping & handling	
Shipping and insurance extra	

CIRCLE 566 ON READER SERVICE CARD

PC Magazine Classified

is #1 in classified ad lineage in IBM-Standard computer publishing. Join the winning team and place your ad.

Call (212) 503-5115 or (800) 825-4237

EXPANSION UNITS

CALL DRAM CO

- Your PC Magazine memory source for 4 years
- 1 Yr. Warranty on Parts
- Parts New & Guaranteed
- Prices Subject to Change

• No surcharge Visa/MC
• COD Cash Co. Chk. OAC
• PO's Accepted from Govt & Qualified Co's

★ **CHIP HOTLINE** ★
(800) 488-DRAM

Tech Supp (415) 398-4714
Tel (415) 398-2987
Fax (415) 398-5402

CALL DRAM COMPANY
P.O. Box 590127
San Francisco CA 94159

DRAMS

1MB X 1 80NS	\$ 4.45
1MB X 1 70NS	\$ 4.95
1MB X 1 60NS	\$ 5.50
256K X 4 80NS	\$ 5.25
256K X 1 100NS	\$ 1.65
256K X 1 80NS	\$ 1.75
64K X 4 80NS	\$ 2.25

*Call for prices on others

SIMMS/SIPPS

IBM TYPE SIMMS	
4MB X 9 - 80NS	\$165.00
1MB X 9 - 80NS	\$ 43.00
1MB X 9 70NS	\$ 45.00
1MB X 9 60NS	\$ 48.00
256K X 9 80NS	\$ 14.00

*Please Add \$2 For SIPPS

APPLE TYPE SIMMS

4MB X 8 80NS	\$160.00
1MB X 8 80NS	\$ 40.00

SUN SYSTEM TYPE SIMMS

4MB Kit	\$175.00
16MB Kit	\$675.00

PS/2 UPGRADES

30/286 Exp. Bld #1497259	
512K Kit 30F5348	\$ 35.00
2MB Kit 30F5360	\$109.00
70 E61-121 50Z 55SX 65SX	
1MB 6450603	\$ 49.00
2MB 6450604	\$595.00
55SX 65SX 34F3077 34F3011	
4MB 34F2933	\$219.00

Model 70-A21

2MB 6450608	\$109.00
-------------	----------

Model 80 s

1 2 4MB	\$ Call
---------	---------

Model: 90 95 P75

2MB 6450902	\$119.00
-------------	----------

4MB 6450128	\$265.00
-------------	----------

Exp Bld 50 50Z 55SX 60 65SX

2 8MB w 2MB	\$359.00
-------------	----------

2 16MB w 2MB	\$425.00
--------------	----------

Exp Bld All Models 70 & 80

2-14MB w 2MB	\$359.00
--------------	----------

4-16MB w 4MB	\$499.00
--------------	----------

L40SX 2 4MB	\$ Call
-------------	---------

LAP/PORT UPGRADES

TOSHIBA	
T1000 s	\$ Call
T3100E 2MB	\$ 129
T3100SX 2MB	\$ 115
4MB	\$ 219
T3200SX 2MB	\$ 115
4MB	\$ 219
T5200 T8500 2MB	\$ 115
8MB	\$ 599

COMPAQ

Port 386-20 1MB	\$ 199
LTE 286 1MB	\$ 89
2MB	\$ 149
4MB	\$ 399
LTE 386/20 1MB	\$ 165
4MB	\$ 469
SLT 286 1MB	\$ 129
4MB	\$ 459
SLT 386 1MB	\$ 129
4MB	\$ 399
ZENITH DATA SYS	\$ Call
NEC PROSPEED	\$ Call

DESKTOP UPGRADES

COMPAQ DESKPRO	
286E 386/20 20E 25	
1MB 113131 001	\$ 79
4MB 113132 001	\$ 215
386s 16	
1MB 113646 001	\$ 79
4MB 112534 001	\$ 215
286N 386N 386SX/20	
1MB 118688 001	\$ 59
2MB 118689 001	\$ 109
4MB 118690 001	\$ 219
386-33 486-33 SysPro	
2MB 115144 001	\$ 125
8MB 116561 001	\$ 689
AST	
Premium 386C 386 16	
1MB 500510 007	\$ 69
4MB 500510 008	\$ 199
Premium 386 20	
1MB 500510 003	\$ 89
4MB 500510 004	\$ 259
H-P VECTRA	\$ Call
NEC POWERMATE	\$ Call

LASER PRINTR UPGRADES

HP II, IIO, IIP, III, IIO	
1MB	\$ 75
2MB	\$ 115
4MB	\$ 195
PANASONIC 4420, 4450I	
1MB	\$ 95
2MB	\$ 135
4MB	\$ 215
IBM 4019, 4019E	
1MB	\$ 95
2MB	\$ 135
3 5MB	\$ 195
CANON, OKI, TI	\$ Call
MATH CO'S	
INTEL 80287	\$ Call
INTEL 80387	\$ Call
CYRIX 83587 16SX	\$ 119
20SX	\$ 129
CYRIX 83087-16DX	\$ 179
-20DX	\$ 179
-25DX	\$ 179
-33DX	\$ 189

CIRCLE 567 ON READER SERVICE CARD

PRINTERS

SAVE ON HP!!

PaintJet	\$850	LaserJet II, III	CALL
PaintJet XL	\$1,375	LaserJet IIO	\$1,395
DeskJet	CALL	7470 Plotter	\$395
DeskWriter	\$435	7440 Plotter	\$650
RuggedWriter	\$650	7475 Plotter	\$795
ScanJet	\$750	7550 Plotter	\$1,295

Call for other HP items not listed

All above equipment demo or used with warranty

LASER PRINTER MEMORY

	1MB	2MB	4MB
HP LaserJet II, IIP, III, IIO	\$100	\$145	\$235
Panasonic 4420, 4450I	\$125	\$175	\$265
Epson, Packard, Bell, Toshiba	\$125	\$175	\$265
IBM 4019, 4019E	\$125	\$175	\$265
TI MicroLaser	\$110	\$215	\$395
Olivetti 400, 800, 820	\$195	\$235	\$325
OMS PS-410	\$165	\$215	\$295

Postscript for HP \$325 TAX FORT \$115

Call for Laser and DeskJet accessories, price with availability subject to change

800 441-1491

COMPUTER BUSINESS MART, INC.

10215 Buena Vista, #A, Santee, CA 92071
(619) 449-9040 • FAX (619) 449-7929
Purchasing (619) 449-7974

CIRCLE 568 ON READER SERVICE CARD

ADOBE PACIFIC DATA PRODUCTS

and other brands of
LaserJet Enhancements
• Lowest Prices Guaranteed
We Know What We Sell.

CALL 1-800-747-HPLJ
1-800-747-4755
1540 Climer Ave
Los Angeles, CA 90025
FAX (213) 478-4770
Phone (213) 478-4477

CIRCLE 569 ON READER SERVICE CARD

Classified
Advertising Information
(800) 825-4237

TAPE DRIVE SUBSYSTEMS

9-Track Tape Subsystem



Now you can exchange data files between your IBM PC/XT/AT and any mainframe or mini-computer using IBM compatible 1600 or 6250 BPI 9-Track tape. Unit can also be used for disk backup. Transfer rate is up to 4 megabytes per minute on PCs and compatibles. Subsystems include 7" or 10 1/2" streaming tape drive, tape coupler card, cables and software.

QUALSTAR

9621 Brindale Avenue
Chatsworth, CA 91311
Telephone: (818) 882-5822

CIRCLE 570 ON READER SERVICE CARD

SAVE ON 9 TRACK TAPE SYSTEM

FOR IBM PC/XT/AT
286/386/486



- Mainframe to PC Data Transfer
- High Speed Backup
- All Software, Complete System
- Service and Support, Easy Installation

call (919) 783-8400 or write to:

CONTECH Computer Corp.

P.O. Box 7368 Wilmington, NC 28408

CONTECH

CIRCLE 571 ON READER SERVICE CARD

SOFTWARE/ACCOUNTING

Calling about an ad?
Say you saw it in
PC Magazine Classified

ACCOUNTING

Tear into a test drive of our most popular accounting software for \$19.95. **BusinessWorks** handles everything from General Ledger, Receivables & Payables to Inventory & Payroll. Quickly. Efficiently. Painlessly.

1-800-447-5700

BusinessWorks, Winner of PC World's Best Buy and InfoWorld's Best In It's Class Awards. Get It!



Manzanita
SOFTWARE SYSTEMS

CIRCLE 572 ON READER SERVICE CARD

MIP Fund Accounting System

Simply the best software for non-profit & governmental organizations since 1982.

Flexible Chart of Accounts • Automatic Offset & Interfund Balancing • Automatic Cost Allocations • Monthly Budgeting & Forecasting • Check, P.O., & A/R Bill Printing • Multiple Funds • Multiple Overlapping Fiscal Years • User Defined Reports • IBM PC/XT/AT Compatible • Single User or Network • User Installable

Modules: General Ledger, Budget Reporting, Accounts Payable, Encumbrances, Accounts Receivable, Database Interface, Payroll, Fixed Assets

1-800-647-3863

505 East Huntland Drive, Suite 340, Austin, TX 78752

ACCOUNTING

EDUCATION

ENTERTAINMENT/GAMES

CAPTOOL®

"For its price, Captool, from Techserve, is the best portfolio manager you can buy."

PC Computing 12/89

TECHSERVE, Inc. Box 70056, Bellevue, WA 98007

CIRCLE 573 ON READER SERVICE CARD

Super Portfolio Manager

- Stocks, Bonds, Mut. funds, etc.
- Before/After-tax ROI/IRR calcs
- Spec., Avg., Fito/Life tax lots
- Price downloads, mgv avg plots
- Bond swaps, YTM/YTC calcs
- 24+ reports, graphics & more

\$99 Chk/Visa/MC \$4 S&H

1-800-826-8082

B.S. & M.S. in Computer Science

• ALL COURSES BY CORRESPONDENCE

- Increase your earning power
- Join students from leading computer companies
- Most courses fully interactive

AMERICAN
INSTITUTE
COMPUTER
SCIENCES

For free
information call:
1-800-767-AICS

Adult VGA Software

Visualize the full potential of VGA and SVGA.

Hi-res, 256 color images.

- Vol. 1 **Sexy** (6 disks per vol.) \$13.95
- Vol. 2 **Nude** \$13.95
- Vol. 3 **More Nude** \$13.95
- Vol. 4 **Adults Only** \$13.95

Hi-res VGA animation. Just like the movies!!!

- Vol. 5 **Adult VGA Movies** \$13.95
- Vol. 11 **Hot Italian Movies** \$13.95
- Vol. 12 **Long Length Movies** \$13.95

Special: Order 4 volumes, select 5th free!
Choose from six 5 1/4" DD disks, three 5 1/4" HD (best deal), three 3 1/2" DD, or two 3 1/2" HD for each vol. All disks are full. Vol. 12 available in only HD disks.

Get more great software for less. Guaranteed. Fast service. Order today. Includes \$3 S&H. Must state age 21 or over. Send check or MO to:
JCVware Dept. M, P.O. Box 36
Normal, IL 61781
tel. orders add \$3 US funds only
MC/VISA orders or free catalog call (309)452-7700.

CIRCLE 578 ON READER SERVICE CARD

COMMUNICATIONS

DATA ENTRY

MULTI-LINE PC-DOS BBS

The Bread Board System (TBBS) Secure reliable, full-featured commercial information system for IBM and compatibles. Menu editor allows customization by nonprogrammers. Kermil, X, Y & Z-Modem. High performance allows up to 64 simultaneous callers. Up to 38,400bps. dBASE module available.

eSoft, Inc.
15200 E. Girard Ave. #2550
Aurora, CO 80014
(303) 699-6565

DATA ENTRY

Replace dedicated data input systems
Front-end mainframe applications

KeyEntry III

- LAN or stand-alone environments
- ScreenPainter and MenuManager included
- Batch Control System and Reformat utility
- Spanish, German, and French versions
- Outstanding customer support
- Thousands of users worldwide
- OS/2 version

800-533-6879

FREE DEMO DISK
AVAILABLE TO
QUALIFIED COMPANIES



SOUTHERN COMPUTER SYSTEMS, INC.
(205) 251-2985 FAX (205) 332-4851
In UK: SCS Europe, Ltd. 0753-36550/FAX 0753-36765

DATA ENTRY

Why have over 85% of the largest companies in the U.S. selected the RODE/PC Data Entry System?

The answer will be obvious when you call for information and a free demonstration today.
(415) 323-8195



DPX • 490 California Avenue
Palo Alto, CA 94306

CIRCLE 576 ON READER SERVICE CARD

DATA ENTRY SOFTWARE

HEADS-DOWN data entry and TWO-PASS verification. Fast and powerful, of course, but more importantly, extremely easy to use. Paint the screen formatting in minutes. On-line help text, edit language, batch control.

PC from \$395
Also for LAN's.
IBM AS/400™
IBM S/36

FREE trial

206/776-6443
800/356-0203

COMPUTER KEYES
21929 Mokoh Rd
Woodway, WA 98020

ENGINEERING

SIMULATION

GPSS/PC is a full-power version of GPSS, the most popular mainframe simulation language. Specifically designed for interactive use on today's high-speed microprocessors, it is loaded with features such as interactive graphics and animation. Using GPSS/PC, you can predict the behavior of complicated real world systems. MINUTEMAN SOFTWARE
P.O. Box 171/B
Stow, MA 01775
800-223-1430/508-897-5662 Ext 316

ENTERTAINMENT/GAMES

JOKES

A NEW Joke EVERY DAY!
"THE DAILY JOKER" INTRODUCES
"THE ZANY-MISH-MASH COLLECTION"
of the newest, most hilarious jokes
Guaranteed to keep you laughing all year

MAKES A FANTASTIC GIFT
GREAT FOR HOME OR OFFICE

FOR THE USER
INTRODUCTORY PRICE OF
\$19.95

RUNS ON ANY PC/XT/AT OR COMPATIBLE
WITH MONITOR/EGA/RGB/VGA DISPLAY

VISA OR MC ORDERS BY PHONE (616) 885-8571
CASH CREDIT INFO TO: 800-483-1181
SEND MONEY ORDERS TO:
"THE DAILY JOKER"
c/o CONNELL & PIERCE
PITTSBURGH, PA 15201

NOTE: PLEASE SPECIFY 3 1/2" OR 5 1/4" DISKETTE

CIRCLE 579 ON READER SERVICE CARD

SeXXy Software

Must State Age Over 21

SeXXy Disk #1 — An unbelievable visual erotic encounter. MUST SEE!

SeXXy Disk #2 — **NEW!** 3 Erotic encounter games for friends and lovers guaranteed to shed both clothes and inhibitions.

SeXXy Disk #3 — An anatomical arcade game with unusual ammunition.

SeXXy Disk #4 — 2 more incredible visual erotic encounters... impress your friends.

SeXXy Disk #5 — Create your own erotic fantasies about friends and lovers.

SeXXy Disk #6 — **NEW!** View porn or edit ten sizzling pictures including celebrities.

\$7 each, any 3 for \$17, or all 6 for \$32.
In IBM & compat. VGA, EGA or VGA graphics req'd.

SeXXcapades — The first adult game with TRUE SOUND and 80 sizzling 256 color VGA scenes!
• Sexual preference and foreplay options • Play with 2-8 close friends • Over 5MB of pure action!

• Fulfill your sexual desires with new experiences • Find out how your partner would really like to make love

\$79 — Special offer: **\$89** with purchase of any CC disk above. **OURS EXCLUSIVELY!**

ADD \$3 S/H • 3.5" OR FOREIGN ORDERS ADD \$2 PER DISK • IN PA ADD TAX

VISA/MC Orders only 800-243-1515 Ext. 600CL
24 HRS./7 DAYS • Or check/MO to: SeXXy Software, 2880 Berg Rd. Dept 600CL, Hatfield, PA 19440

CIRCLE 577 ON READER SERVICE CARD

CONNOISSEUR COLLECTION

ALL NEW! in 256 Color VGA!!

SeXXy Disk #CC1 — ★ **YOU BE THE STAR** ★
The FIRST CUSTOMIZABLE movie allows you to write the dialog and the title. You can star with the partner of your choice. Incredible scenes display with your dialog. **ONLY AVAILABLE FROM US!**

SeXXy Disk #CC2 — **THE FIRST SOUND MOVIE!**
The first computer erotic movie with SOUND. See the incredible 256 color VGA graphics while hearing the actual dialog. **OURS EXCLUSIVELY!**

SeXXy Disk #CC3 — **THE BEST MOVIE!**
The best computer movie available. Only for the serious collector. 256 stunning VGA colors.

1 Movie \$29, 2 Movies \$49, 3 Movies \$65
All CC Disks Require VGA monitor and hard disk — over 1 MB of action.

Front-End to Host Applications

- End-user data entry
- Replaces key-to-disk systems
- Menu-driven edit selection
- Easy form design
- International distributors
- Toll-free support hotline

DATALEX 800-962-8888

415 382 4466 FAX 415 382 5733
From Canada 800-848 5548

CIRCLE 574 ON READER SERVICE CARD

EDUCATION

Version 1.20 now shipping!

Millennium

Puts today's headlines in historical perspective...

A complete graphic guide to the history of Europe and the Middle East from 1000 AD to the present. Maps are scalable and change continuously from year to year. Print to laser or dot-matrix printers. Export maps in TIFF or PCX format. Includes descriptive text narrations linked to map.

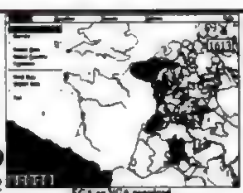
Clockwork Software

P.O. Box 14104, Chicago, IL 60614 USA

\$89

(312) 281-3132

CIRCLE 575 ON READER SERVICE CARD



To place your ad in
PC MAGAZINE CLASSIFIED
Call (212) 503-5115 or (800) 825-4237

ENTERTAINMENT/GAMES

Fonts

Graphics

Swimsuit Calendars

DON'T SETTLE FOR LESS WHEN YOU CAN HAVE THE BEST

- Special Holiday Offer
- Super VGA 800x600 PCX Images
- Ideal for Windows Wallpaper
- Makes A Great Gift

Only \$29.88, each additional purchase \$24.88



#904 Lovely Ladies

This year add some spice to an ordinary computer. Every month is a treat.

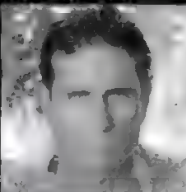
DOS & Windows viewers included
Comes on 9 high density disks
Hard drive not required

24 hour / 7 days
To order call
800-354-5353

US and Canada

Add \$3 for S&H
Add \$3 for Foreign
Add \$3 for 3.5" disks
FL add 6% sales tax

Send check or money order to:
Starware Publishing Corp.
P.O. Box 4188, Dept. 23
Deerfield Beach, FL 33442



#905 Hot Hunks

These hot hunks are sure to inspire you to new heights every month.

CIRCLE 580 ON READER SERVICE CARD

Your Font Source

Software Developers!

Do you need fonts
to bundle with your product?

We offer:

- more than 400 styles
- Reasonable licensing fees
- Minimal paperwork
- both bitmap & scalable formats

Call or FAX us today for your free
OEM FONT LICENSING KIT

DIGI-FONTS®

528 Commons Dr, Golden, CO 80401
303/526-9435 303/526-9502 FAX

CIRCLE 584 ON READER SERVICE CARD

FOREIGN LANGUAGES

Diplomat Software

Alphabets Of The World For Your PC



Series of 36 alphabets providing both English and foreign characters for screen, keyboard and printer support while using existing software: WordPerfect, Word, WordStar, Quattro Pro, Ventura Publisher, Works, dBase... more.

Diplomat Software
3700 Campus Drive, Suite 202, Newport Beach, CA 92660
Phone (714) 474-8868, Fax (714) 250-8117

CIRCLE 585 ON READER SERVICE CARD

Did you know...

PC Magazine Classified generated a whopping \$200 million in annual sales revenue for its advertisers, resulting in these expenditures—

- Over \$52 million in applications software
- Over \$52 million in computer systems
- Over \$22 million in supplies
- Over \$12 million in systems
- Over \$61 million in peripherals
- Over \$500,000 in consulting services
- Over \$8.9 million in other computer products and services

Computer Images



Use toll-free 800 # to sign up with credit card. Once verified use same 800 # to download files.

1-800-GO-MODEM

Or use direct dial 64 Line BBS at
(503) 697-5100 8/N1

SuperVGA 1024x768x256

**ASTRONOMY • HUGE ADULT AREA
SCENIC • GRASP • ANIMATOR • 3D
STUDIO MOVIES • SOUND • GAMES
UTILITIES • IMAGE CONVERTERS**

Event Horizons Commercial BBS, thousands of images and movies. Must be 21 to download from adult areas. Quality Color SuperVGA/VGA /EGA. 1200/ 2400 bps \$10/hr., 9600 bps \$40/hr., 800# \$6/hr. extra. Also Professional Image Scanning from prints or slides to disk.

No Modem? Order our Mail Image Library with samples \$9. World-wide shipment. Info voice line 503-697-7700. All credit cards accepted. Same day shipment.

Event Horizons

311 Ave. B, Ste 209
Lake Oswego, OR 97034

Voice 503-697-7700, BBS 800-466-6336, or BBS 503-697-5100

CIRCLE 625 ON READER SERVICE CARD

MAILING PROGRAMS

MAIL ORDER MANAGER (M.O.M.)

The complete solution for the mail order business—order entry-review, credit card processing, UPS manifesting, profit analysis, accounting, Clipper compiled, dBase III+ files, Inbound/Outbound Editor's Choice—find out why more people buy M.O.M. after comparing. Single Station and Network Systems. Dydacomp Development Corporation. P.O. Box 641. Wayne, NJ 07470. (201) 694-0779.

Calling about an ad?
Say you saw it in
PC Magazine Classified

PENTHOUSE MAGAZINE COMES ALIVE ON YOUR COMPUTER!

Try the New **ONLINE SERVICE** of PENTHOUSE MAGAZINE. It's incredible! You can finally use your computer for something that you will truly enjoy.

- **DOWNLOAD** beautiful color images of Penthouse Pets
- **HAVE UNINHIBITED CHAT** with Penthouse Pets and special guests from around the world
- **RECEIVE** revealing **ELECTRONIC MAIL** from other members
- **EXPERIENCE** much more!

We'll even provide the software to maximize your computer's graphic abilities!

**TO GET YOUR COPY OF OUR SOFTWARE,
AND INFORMATION ON HOW TO ACCESS THE SYSTEM IN YOUR AREA,
USE YOUR MODEM TO DIAL:**

1-212-254-3838

CIRCLE 581 ON READER SERVICE CARD

XXX-RATED CD-ROM

THE BEST VALUE IN ADULT SOFTWARE
\$500 of VGA movies & images for only

For ordering information refer to the
"1992 Swimsuit Calendars" advertisement
in this section of the magazine.
Only From Starware Publishing Corporation

\$59.88

CIRCLE 582 ON READER SERVICE CARD

Where Adults Come To Play! ODYSSEY BBS

- Local Numbers Covering 850 US Cities
- Interactive Multiplayer Games
- CB-Style Group and Private Chat
- National Classified Ads
- 1000's Of Shareware Programs
- Giant Message Forums
- Matchmaker Dating Database

FOR FREE DEMO AND LOCAL NUMBER CALL

818-358-6968

BY MODEM. MUST BE OVER 18 3/12/2400,8/N/1

SECURITY

STOP SOFTWARE PIRACY



Hardlock
Programmable, algorithmic
response and memory,
option — all in one

Call for information
on our disk-based systems.

Developers Say...

"Since the Hardlock uses an algorithmic response chip, I am assured of the highest level of protection. Also, the optional programmable memory means I can keep custom configurations in Hardlock. I can protect my .EXE or .COM files directly and/or incorporate Glenco's high level language interface routines into my software."

Accountants Say...

"Since our software can't be copied, our revenue has steadily increased. The unique programming board allows us to program the Hardlock in seconds. This ensures optimum delivery schedules from Glenco and a lower inventory cost for us. Hardlock's field programmable feature means a single Hardlock can protect more than one product."

End Users Say...

"Hardlock allows me to backup my software in vestment. I just plugged Hardlock into the printer card, connected the printer cable, and forgot about it."

GLENCO

ENGINEERING INC.

270 Lexington Drive
Buffalo Grove
Illinois 60089-6930
(708) 808-0300
FAX 808-0313
1-800-562-2543

SERVING THE SOFTWARE INDUSTRY SINCE 1979

CIRCLE 591 ON READER SERVICE CARD

H A R D L O C K
For a distributor in Europe contact: FAST Electronic GmbH 49-89-539800-20 FAX 49-89-539800-40

STATISTICS

Power Designed to Fit Your Needs

MINITAB is the easy-to-use statistical package that lets you master a broad range of functions within one hour.

- Basic Statistics
- Regression
- Control Charts for SPC
- Hi-Res Graphics
- Time Series
- ANOVA and ANCOVA

...and more

CALL 800-448-3555

MINITAB

STATISTICAL SOFTWARE

Minitab Inc.

3081 Enterprise Drive / State College, PA 16801

CIRCLE 592 ON READER SERVICE CARD

Did you know...

83% of PC Magazine's subscribers have purchased or authorized the purchase of PC products from direct marketers in the last 12 months.

Get all the facts. Call your PC Magazine Marketplace Account Representative for more information or to place your ad, 212-503-5115 or 800-825-4237.

PC Magazine Classified

is #1 in classified ad lineage in IBM-Standard computer publishing.
Join the winning team and place your ad.

Call (212) 503-5115 or (800) 825-4237



SOFTWARE OR HARDWARE GUARDING YOUR \$PROFIT\$

Since 1986, thousands of companies worldwide have chosen Az-Tech Software as partners in their fight against Software Pirates. Why? Because Az-Tech has offered them

EVERLOCK SOFTWARE COPY PROTECTION

EVERTRAK SOFTWARE SECURITY

EVERKEY II "The LOCK" HARDWARE SECURITY

These SECURITY SYSTEMS offer
REMOTE RESET CONTROL
SERIALIZATION
DATE & EXECUTE LIMITS
COMPRESSION
ENCRYPTION
and much, much more



These systems are easy to use and most important, they work! No others can provide the Compatibility Flexibility Ease of Operation and Degree of Protection that You receive with Az-Tech products

Call Today for a FREE Demo
800-227-0644



Az-Tech Software, Inc.
Security Products That Work
201 East Franklin, Suite 11
Richmond, MO 64085

(816) 776-2700 • FAX (816) 776-8398

CIRCLE 593 ON READER SERVICE CARD

TAXES

W2/1099 SOFTWARE

Major companies and CPA's rate our software tops! Create forms on HP LaserJet or use any preprinted forms. Creates IRS ready diskettes. Convenient data entry or import from dBase, Lotus or ASCII file. W2 & all 1099's. Network Ready! Easy to learn & use—Free Phone Support! \$129.00 (Network Version—\$259).

Newport Wave, Inc.

15 Mc Lean

Irvine, CA 92720

(800) 999-2611

TAXES

AM-TAX

The fast, easy, accurate way to prepare your 1991 tax return.

Personal-1 Version: (IBM w/320K)
Calculates Form 1040 plus 29 other common forms and schedules. All printed forms (incl 1040) approved for filing by IRS.

Only \$40

Personal-2 Version: (IBM w/320K)
Calculates Form 1040, 1040A plus 50 other forms and schedules.

Only \$65

State programs for AZ, CA, GA, IL, IN, KS, KY, MD, MO, NJ, NY, NC, OH, PA, SC, and VA. Data auto-transferred from federal tax forms. \$30 each.

Professional Version with client letters and billing (just \$125), Laser and Elec Filing available.

AM SOFTWARE
P.O. Box 25010
Kansas City, MO 64119
Orders (816) 426-8361
FAX (816) 741-1517

CIRCLE 594 ON READER SERVICE CARD

MISCELLANEOUS/ BAR CODING

EZBarcode® Readers for PC, PS/2, Terminals

- Five year warranty — the best in the industry
- Free bar code printing utility included
- Installs in minutes — no drivers or software changes necessary
- Autodiscriminating — reads all standard symbologies
- In stock, fast shipping
- 30-day money back guarantee

\$289 with regular price \$349



- with stainless steel wand \$349
- with laser scanner \$1385
- with 3" CCD scanner \$885
- RS-232 serial version...add \$30

Also available: Portable bar code readers and bar code printing software

TimeKeeping Systems, Inc.

1306-A East 55th Street • Cleveland, OH 44103
(216) 361-9905 • FAX: (216) 361-0030

Classified Advertising
Information
(800) 825-4237

BAR CODING

BAR CODE HEADQUARTERS

LABELING SOFTWARE



- For Epson, Oki, IBM, Dot Matrix and HP LaserJet Printers.
 - Any Format. Any size. Totally flexible design. Many formats furnished.
 - One Screen Label Design, WYSIWYG or text. Context sensitive help.
 - 16 text sizes — from .1" to 3" (reads at 100').
 - 13 Bar codes: 2of5, 128, UPC/EAN, MIL-STD, AIAG, ZIP, & Code 39.
 - Auto-incrementing. Simple operator interface. File input.
 - Reversals, color, soft fonts. Prints PCX files for logos, symbols, etc.
 - Powerful, Versatile, Easy, Fast! (drives LaserJet at 8ppm).
 - Scalable fonts any size to 13" on LaserJet III.
 - Label shown printed with LabelRIGHT™ — \$279
- (Other DOS bar code programs from \$129. SCO/UNIX — \$199).

PORTABLE READERS

- Battery operated reader. Wand or laser input.
- Simple, powerful, 64K or 256K memory. Built in real-time clock.
- Bar code or keyed input. Easy raised rubber keyboard.
- Reads Codabar, MSI, 2of5, UPC/EAN, 128, Code 39.
- Easily programmable prompts. RS-232 or keyboard wedge models.
- Doubles as non-portable reader (on-line wedge operation).
- 64K models, complete with wand — \$799



BAR CODE READERS

- For PC, XT, AT, PS/2, Mac and all RS-232 Terminals
- Attaches as 2nd keyboard. No software changes needed.
- Reads 2of5, Codabar, UPC/EAN, 128, MSI, Code 39.
- 1 or 2 input scanners: wand, slot badge, magstripe, or laser.
- Top rated by independent review!
- Complete with steel wand — \$399.

Direct from manufacturer
30 day \$ back guarantee!
Company P.O.'s accepted
2 year warranty on wand & reader

WORTHINGTON

DATA SOLUTIONS

417 Ingalls Street • Santa Cruz, CA 95060

FAX 408-458-9964

408-458-9938

800-345-4220

PC WAND BAR CODE READERS

MORE FEATURES
MORE AFFORDABLE



Starting at \$279 with wand! • Transparent operation. • No software required • PC, XT, AT, Mac, PS2, others. Look into our full line of reliable, competitively priced readers. Keyboard and serial wedges, portable data collectors, multi-drop readers, wands, laser scanners, mag stripe readers, and bar code printing software • OEM and reseller discounts. We provide solutions to systems! Custom application software for Data Collections available. Call for details.

INTERNATIONAL
TECHNOLOGIES
& SYSTEMS CORP.

655-K North Berry St., Brea, CA 92621
(714) 990-1880 • FAX (714) 990-2503
13 Welwyn Ct., Richmond, VA 23229
(804) 741-6725

CIRCLE 595 ON READER SERVICE CARD

Did you know...

PC Magazine Classified generated a whopping \$200 million in annual sales revenue for its advertisers, resulting in these expenditures—

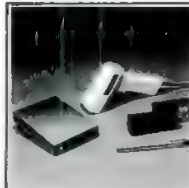
83% of PC Magazine's subscribers have purchased or authorized the purchase of PC products from direct marketers in the last 12 months.

Get all the facts. Call your PC Magazine Marketplace Account Representative for more information or to place your ad, 212-503-5115 or 800-825-4237.

Did you know...

On average, PC Magazine's direct market purchasers have spent—

- \$30,000 on hardware
- \$5,400 on software
- \$2,100 on accessories
- an average of \$2,855 per order



BAR CODE & MAGNETIC STRIPE READERS For PC/XT/AT, PS/2, and RS-232 Interface

- Direct keyboard interface, no software change
- Reads UPC, EAN, Code 39, 11, 128, 125, Codabar, MSI
- Direct from manufacturer, 30 day money back guarantee
- Reader with plastic wand: \$280, with steel wand: \$350
- with Magnetic Strip Scanner: \$230
- Bar Code Labeling software from \$50
- Reseller discount available, direct from manufacturer

SCANTECH 12961 Ramona Blvd. Unit 1 Tel: (818) 960-2999
Inland CA 91706-3797 Fax: (818) 962-4819

ONE MAGAZINE DELIVERS THE BIGGEST
MARKET OF PC BUYERS: PC MAGAZINE

800,000

BAR CODING

BAR CODE READERS
AMERICAN MICROSYSTEMS
2190 A Regal Pkwy. • Euless, Texas 76040 • (817) 571-9015
FOR PC, XT, AT, PS/2 & TERMINALS:



- No software changes required
- Data appears as keyboard input
- Reads Code 39, 1-2of5, UPC/EAN, Codabar, 128, 93, 11, MSI/Plessey
- Auto-discriminates between codes
- Accepts WAND, SLOT, CCD, LASER, MAG STRIPE

BAR CODE PRINTING SOFTWARE:

- For Epson, OKI, IBM, Dot Matrix and HP LaserJet Printers.
- Prints Code 39, 1-2of5, UPC/EAN, Codabar, 128, 93, 11, MSI/Plessey
- Easy to use

(800) 648-4452 • FAX: (817) 685-8232
30 Day Money Back Guarantee One Year Warranty

DISK CONVERSION

TOTAL SERVICE CONVERSIONS

- OUR NAME SAYS IT ALL •
 - Quality Service •
 - Quickest Turnaround •
 - Lowest Prices •
 - Free Test Conversion •
 - WordPerfect Training available •
 - 1-800-5-CONVRT (526-6878) •
- TOTAL SERVICE CONVERSIONS, INC.
1933 North Monon Street
Los Angeles, CA 90027

QUALITY CONVERSIONS

- Convert IBM, CPT, MAC, DEC, NBI, WANG, LANIER, XEROX, VYDEC, 3000 & others
 - Customization available
 - 9-Track and most Cartridges
 - Scanning OCR - IMAGES
 - Databases, Mail lists, Spreadsheets
 - BEST RATES • FAST • FREE TEST
- 1st RUN COMPUTER SERVICES INC
1261 Broadway, Suite 508
New York, NY 10001
(212) 779-0800 • (800) 833-2207

DATA RECOVERY SERVICES

Ontrack Data Recovery

The Leader in Data Recovery Services

- 95% Success Rate
- Fast Turn Around
- Professional Clean Room
- Expertise with Novell, DOS, Macintosh, OS/2, Unix, Xenix, Bernoulli, Sun and more!

1-800-872-2599

INTL: 612-937-5161 • FAX: 612-937-5750
6121 Bury Drive, Eden Prairie, MN 55446



Ontrack
DATA RECOVERY

BOOKS/CATALOGUES

IBM Specials PC Jr - CONVERTIBLE

- ACCESSORIES & SERVICE
for BOTH IBM MODELS**
- MEMORY EXPANSION
 - HARD DRIVES
 - SERIAL PORTS
 - PRINTER PORTS
 - SOFTWARE

MANY MORE SPECIAL ITEMS

FREE CATALOG
214 - 276 - 8072



P.O. Box 461782
Dept. PCM
Garland, TX 75046-1782

FAX & BBS 214 - 276 - 8072

CIRCLE 596 ON READER SERVICE CARD

DATA CONVERSION

CONVERTING YOUR DISKETTES?

ENTRUST THEM TO US

2500 Word Processor & Computer
Formats 5 1/4 & 5 1/8 DISKS MAGNETIC
TAPES, MAGNETIC CARDS
(CARTRIDGES, CASSETTES & 8mm)

DISK DUPLICATION OCR SCANNING SERVICES

Customized conversions too!
Call us for quality, best prices and
quickest turnaround time

COMPANY COMPENDIA, INC.
TEL: 312-419-8771 (Chicago)
FAX: 312-419-1390

CIRCLE 597 ON READER SERVICE CARD

DATA CONVERSION

DATA CONVERSION

If you want the
most complete
conversion
services in the
industry, just
call...



(800) CONVERT

Capabilities
include over
3000 formats.

**PIVAR
COMPUTING SERVICES, Inc.**

165 Arlington Heights Rd. #M
Buffalo Grove, IL 60089
(708) 459-6010

CHANGING WORD PROCESSORS?

Media transfer to or from
IBM, XEROX, DEC, WANG, EXXON, MACS,
LANIER, CPT, CT, MICOM, NBI, WRDPLX,
WORDSTAR, WORDPERFECT, MS.WRD, DWA,
MULTIMATE, SAMNA, MASII, DCA

*****FREE TEST CONVERSION*****

Conversion Specialists
531 Main St., Suite 835
El Segundo, CA 92045
(213) 545-6551
(800) 825-0540

To place your ad in

**PC MAGAZINE
CLASSIFIED**

Call **(212) 503-5115**
or **(800) 825-4237**

Calling about an ad?
Say you saw it in
**PC Magazine
Classified**

OUR WINDOWS REFLECT WELL ON YOU!

Your four-color ad in Premier's exclusive
new Windows section—a brilliant
showcase strictly for Windows
advertisers—shows that you know where
big buyers in big numbers shop direct for
Windows products and support. Reach
PC Magazine's 800,000+ brand specifiers
where they come to buy every issue!

PC MAGAZINE PREMIER WINDOWS

Call 800-825-4237

DISKETTE COPY SERVICES

SOFTWARE DUPLICATION

- One-Stop Shopping
- Diskettes & Tapes
- Document Printing
- Custom Printing
- Custom Packaging
- Fulfillment
- Fast Turnaround



MEGAsoft

P.O. Box 6609, Freehold, NJ 07728

800-222-0490

In NJ 908-462-7628

FAX 908-462-5658

CIRCLE 598 ON READER SERVICE CARD

DUPLICATION FROM \$.59 HIGHEST QUALITY MEDIA

MSDOS duplication from \$.59 (5 25") and \$.86 (3 5"). Prices go even lower as you continue to order!

- Duplication + 100% Verification
- Custom Labels/Sleeves/Mailers
- Custom Packaging & Assembly
- Colored Media Available
- Special Rates For Demo Software & Site Licensing
- Educational Discounts Available
- 24 Hour Turn-Around
- Guaranteed Products

800-255-3142

Diversified Systems Group, Inc.
PO Box 1114, Issaquah WA 98027

CIRCLE 599 ON READER SERVICE CARD

Did you know...

PC Magazine Classified generated a whopping \$200 million in sales revenue for its advertisers, resulting in these expenditures—

- Over \$52 million in applications software
- Over \$52 million in computer systems
- Over \$22 million in supplies
- Over \$12 million in systems
- Over \$61 million in peripherals
- Over \$500,000 in consulting services
- Over \$8.9 million in other computer products and services

Get all the facts. Call your Account Representative for more information or to place your ad, 212-503-5115 or 800-825-4237.

**For Expert 24 Hour
Software Duplication
Call 800-533-4188**

- ◆ 100% Satisfaction Guaranteed
- ◆ Superb 7 Step QC Process with Digital Diskette Analysis
- ◆ Turnkey Printing, Packaging & Assembly Service Provided

ECHO
DATA SERVICES, INC.
In PA 215-363-2400

CIRCLE 600 ON READER SERVICE CARD

INSURANCE



SAFWARE

INSURES YOUR
COMPUTERS

Full replacement of hardware, media purchased software. As low as \$49 yearly. Covers fire, theft, power surges, other accidents. Blanket coverage, no list of equipment needed. Call for information or immediate coverage.

1-800-848-3469
Local (614) 262-0559

SAFWARE, The Insurance Agency Inc.
2929 N. High Street, P.O. Box 02211
Columbus, OH 43202

CIRCLE 601 ON READER SERVICE CARD

Classified Advertising
Information
(800) 825-4237

SUPPLIES

24 HOUR TURNAROUND

QUALITY TONER CARTRIDGE REMANUFACTURING

- 20% More Toner
- Darker Print
- 100% Guaranteed
- Replacement drums now available
- We Buy Empties

Laser Research, Inc.
8334-L Arrowridge Blvd.
Charlotte, NC 28273

1-800-462-7143

\$39.95

SHIPPING INCLUDED

CIRCLE 602 ON READER SERVICE CARD

U.S. Cartridge Service

COLORS AVAILABLE

TONER CARTRIDGES

REMANUFACTURED

for laser printers and PC Copiers

WARRANTY SAFE

92 RANDOLPH AVE.
SO. SAN FRANCISCO, CA 94080

1-800-553-4345

\$29.95

20% MORE TONER
100% GUARANTEED
24 hr. TURNAROUND
WE BUY EMPTIES!!!

415-589-4345

CIRCLE 603 ON READER SERVICE CARD

TONER CARTRIDGES

REMANUFACTURED

TESTED • GUARANTEED • 24-HR. TURN

Send empty cart. with wand.

MICR Toner & Fonts
HP2, 3, 35i

Prices From
• HP, Apple, Canon, etc.
• Canon PC & Sharp Z-Copiers
• IBM 4019 - 4 Colors!
• Inkjet Printer Refills - 5 Colors!
• MICR Toner for Laser Checks

\$45

1-800-239-4027

ADVANTAGE LASER PRODUCTS, INC.
2216 University Blvd. • Tuscaloosa, AL 35404

CIRCLE 604 ON READER SERVICE CARD

FREE GLOBAL CATALOG

172 page guide
to computer furniture,
supplies and accessories

Dial Toll-Free
1-800-8-GLOBAL

GLOBAL
COMPUTER SUPPLIES
11 Harbor Park Dr., Dept. PCM1
Port Washington, NY 11050

CIRCLE 605 ON READER SERVICE CARD

PC Magazine Classified

is #1 in classified ad
lineage in IBM-Standard
computer publishing.
Join the winning team
and place your ad.

**Call (212) 503-5115
or (800) 825-4237**

PC Magazine's BusinessCard section is a forum for innovative, hard-to-find and low-cost PC products and services. Ads are listed by product category and include Reader Service numbers to allow fast, easy response.

RATES:

1 issue-\$600, 3 issues-\$550, 6 issues-\$510, 12 issues-\$480, 17 issues-\$460, 22 issues-\$450. Multiple-ad per issue rates also available. Prepayment must accompany each insertion. VISA/MC welcomed.

AD FORMAT:

PC Magazine will design and typeset each BusinessCard ad. Advertisers should furnish typewritten copy. Ads include: 1) Headline (1 line, initial caps-30 characters max, all caps-25 characters max), 2) Descriptive copy (5 lines, 225 characters max), 3) Company name (same specifications as headline), and 4) Address and telephone number (2 lines, 40 characters per line). No logos, artwork or camera-ready ads. Publisher reserves the right to edit supplied copy to meet section specifications.

DEADLINES:

PC Magazine is published 22 times a year, (bimonthly except for July and August). The BusinessCard closing is approximately two months prior to issue date. Please send copy and payment to: PC Magazine BusinessCard, One Park Avenue, 3rd Floor, New York, NY 10016, ATT: Richard Wortman. For more information, call Richard Wortman at 800-825-4237 or 212-503-5175, FAX: 212-503-5860.

HARDWARE/ADD-IN BOARDS

VOICE MAIL TURNKEY SYSTEMS

•State-of-the-Art Voice Mail/Call Processing Systems - Ready to GO! •Effortlessly process your sales, inquiries, & messages. •Complete Systems (expandable to 16 lines) from \$1495. •Complete Line of Voice Mail Accessories and Software.

VOICE WORLD TECHNOLOGY

43 Monte Vista, Suite 2, Oakland, CA 94611
Phone: 510-655-6020 Fax: 510-655-6038

CIRCLE 1 ON READER SERVICE CARD

HARDWARE/CD-ROM

New Release "VGA SPECTRUM"

•Sound Blaster*Adlib
•Over 1,600 Gif files*Animation
•Top 100 VGA/EGA Games*Utilities
Dealers Welcome*Other Titles Available
\$69-Free Shipping

S & S Enterprises

P.O. Box 552, Lemont, IL 60439
(800)ROM-DISC (708)257-7616

CIRCLE 2 ON READER SERVICE CARD

COMMUNICATIONS

*** REMOTE COMPUTING ***

• Remotely turn on your PC, totally automatic
• Turn on with phone call, set 1 to 15 ring counts
• Auto turn off, 18s-39hrs after telephone session
• 8 outlets, 15 amps, surge protected, UL & FCC'd
• Use any remote software, many features-\$89.95

D C S C

8240 N. Mopac #160 Austin, TX 78759
PH: (512) 343-6323 FAX: (512) 343-2003

CIRCLE 3 ON READER SERVICE CARD

KEYBOARD, VIDEO, MOUSE

EXTENSION with EXTENDER
SPLITTING with COMPANION
SWITCHING with COMMANDER
Boosts SIGNALS UP to 600 FT. Control Up to 96PC's with one KEYBOARD and MONITOR.

CYBEX CORPORATION

2800H Bob Wallace Ave., Huntsville, AL 35805
PHONE 205-534-0011 FAX 205-534-0010

CIRCLE 4 ON READER SERVICE CARD

Attention Windows Advertisers!

Open up new sales opportunities with 800,000+ PC brand specifiers-the lion's share of buyers for the record-breaking 5 million copies of Windows sold in just 18 months-by placing your four-color ad in the new section just opened exclusively for you!

PC Magazine Premier Windows

Call today to place your ad here!
800-825-4237

CIRCLE 5 ON READER SERVICE CARD

COMPUTER SYSTEMS

MOTHERBOARD SPECIALIST

We are specialist in High-End Motherboards and carry the lines of different manufacturers: MYLEX, INTEL, AIR, ATRONICS, DEICO EXPORT experience since three years! Also customized systems configuration.

STELLAR ASSOCIATES INC.

1336-A Channing Way, Berkeley, CA 94702
Tel:(510)649-4831 Fax:(510)704-0845

CIRCLE 6 ON READER SERVICE CARD

LOWEST PRICES ON LAPTOPS

TOSHIBA • AST • LEADING EDGE • ALTIMA •
PANASONIC • SHARP • TEXAS INSTRUMENTS •
ZENITH • TWINHEAD • TANDON • LIBREX
WHEN YOU KNOW WHAT YOU WANT - CALL FOR A QUOTE.

THE LAPTOP BROKERS

305 North Fort Harrison Clearwater, FL 34615
1-800-SHY-NERD 1-800-488-0550

CIRCLE 7 ON READER SERVICE CARD

386 Systems at Wholesale Price

386-25 *SALE*..\$1120 386-33 64k-c..\$1240
Sys incl: .28dp SVGA color mon • 1mb SVGA card
• 1mb ram • 42mb hd • 1.2 & 1.44mb fd • 101kb
• 2s/1p/1g • 1yr warranty ... *FREE MOUSE*
4mb ram..Add\$138 85mb hd..Add \$112

STARLIGHT COMPUTERS CO.

2828 W. Parker Rd. #202c, Plano, Tx 75075
1-800-878-8198 214-596-4785/Fax:596-4887

CIRCLE 8 ON READER SERVICE CARD

486 Systems at Wholesale Price

486-33 64k-c..\$1920 486-33 256k-c..\$1990
Sys incl: .28dp SVGA color mon • 1mb SVGA card
• 4mb ram • 85mb hd • 1.2 & 1.44mb fd • 101kb
• 2s/1p/1g • 1yr warranty *FREE MOUSE*
210mb hd..Add \$286.*BEST QUALITY & SERVICE*

STARLIGHT COMPUTERS CO.

2828 W. Parker Rd. #202c Plano, Tx 75075
1-800-878-8198 214-596-4785/Fax:596-4887

CIRCLE 9 ON READER SERVICE CARD

** Save On Computer Systems **

Mitac notebook 386sx-16.40 mb,w/dos 4.1\$1915
•386sx -20 ,vga,40mb,2meg,2fd,i/o ports \$1448
•386-33/64k cache,svga,89mb,2meg, 2fd \$2090
Your Best source for computer products. Main Boards made in U.S.A., 1yr warranty parts/labor

Computer Systems & Maintenance

1007 Elm St. Suite A Boulder City, NV. 89005
(702) 294-4453 Fax (702) 294-2250

CIRCLE 10 ON READER SERVICE CARD

DISK DRIVES

PS/2 DISC DRIVES

Kit PS/2 25,30 HD PS/2 50Z,55SX, & 70
20Mb - \$195 30Mb - \$245
30Mb - 205 60Mb - 575
40Mb - 245 120Mb - 695
Call for other PS/2 drives and Kits.

Jb TECHNOLOGIES, INC.

5105 Maureen Lane, Moorpark, CA 93021
(805) 529-0908 • FAX (805) 529-7712

CIRCLE 11 ON READER SERVICE CARD

MONITORS

PC MONITOR REPAIR SERVICES

Broken Monitors? Call MONITECH for fast, reliable depot PC monitor repairs. MONITECH specializes in all types of PC monitors-over 1,500 models in all -and backs them with a comprehensive warranty. Volume discounts and expedited services are avail.

MONITECH INC.

2 Caesar Place, Moonachie, New Jersey 07074
1-800-332-9349 FAX: 201-933-5301

CIRCLE 12 ON READER SERVICE CARD

PRINTERS

WE DARE YOU TO COMPARE!

Panasonic Printers KXP4420-\$769 KXP4450+1139
Okidata Printers OL400-\$639 OL830-1349
Computers • Printers • Monitors • Drives • Modems •
Boards • Software • Accessories
CALL our 800 number for a FREE Catalog.

MAINFRAME INC

540 Rt 10 Suite 204 Randolph, NJ 07869
800-786-4809 FAX: 908-852-6784

CIRCLE 13 ON READER SERVICE CARD

PANASONIC RENEWED

KX-P1123 24-Pin, 192cps, 53LQ, 7 Fonts\$189
KX-P1124I 24-Pin, 300cps, 100LQ, 11 Fonts \$259
KX-P1624 24-Pin, Wide Car. 192cps, 63LQ...\$319
KX-P4420 Laser, 8ppm, 22 Fonts, 300dpi... \$649
KX-P4450I Laser, 11ppm, 28 Fonts, 300dpi...\$995

ELECTRIFIED DISCOUNTERS

1066 Sherman Ave., Hamden, CT 06514
800-678-8585, 203-287-1976, FAX 203-248-8680

CIRCLE 14 ON READER SERVICE CARD

TAPE DRIVE SUBSYSTEMS

Stop Waiting For Tape Backups

Start your backup, turn on the "STRIP" & go home. The "STRIP" turns off your computer. A 9 position turn-off timer is the secret. Ask for the FREE "Kit", it lets your computer turn itself off! 8 outlets, 15 amps, UL/FCC \$89.95.

D C S C

8240 N. Mopac #160 Austin, TX 78759
PH: (512) 343-6323 FAX: (512) 343-2003

CIRCLE 15 ON READER SERVICE CARD

SOFTWARE/ACCOUNTING

ACCOUNTING SOLUTIONS

Complete Accounting G/L, A/R, A/P, I/C, Payroll SU/\$149 MU/\$299. Other systems J/C, BOM, Order entry. Call for Prices. Working Demos \$35. All systems use Btrieve(c). Source Code+4GL Lang available. Dealers wanted

Computer Accounting Solutions

700-U E. Redlands Blvd., Redlands, CA 92373
1 (800) 358-4222 or (714) 335-1205

CIRCLE 16 ON READER SERVICE CARD

USA-Tax/1040 \$19.95

Tax return program for PC's. 5th year. LASER and dot-matrix graphic 1040. Over 20 Forms, all IRS approved as printed. Does all computations, FAST and EASY. \$2 S/H. Texas addr 7.25% sales tax. 30-day moneyback guarantee.

Bammel Software

P.O. Box 382194 Duncanville, TX 75138
24hrs 800-324-8518 VISA/MC

CIRCLE 17 ON READER SERVICE CARD

BUSINESS

At Wholesale Point-of-Sale

286 Super slim, 1m, 1FDD, 40m/hd, 9" Display \$695
Star Receipt Printer, Elect. cash drawer \$599
POINT N' SELL, countersale, A/R, PO +Inv. \$279
MicroBiz, RealWorld, Solomon, E-Basic, Cyma call
label printer, pole displ., touch screen call

AAA POSLAND

T (908) 549-3935, F (908) 549-6098

CIRCLE 18 ON READER SERVICE CARD

Throw Away Your Old Checks!

BlankCheck prints fully encoded checks on your LJ2/2D/3/30/3si. Handles 300 checking accounts. Easily integrated with your accounting system. Complete kit including software, MICR toner, and forms only \$799. Demo \$45.

SouthData, Inc.

PO Box 1703, Mt. Airy, NC 27030
800-628-7227

CIRCLE 19 ON READER SERVICE CARD

Increase your client potential!

The Client Database™ allows you to quickly and easily manage your client information and increase profits. Includes searching and sorting, mailing labels, customizable capabilities and much more. Only \$99.95. 30-day Money-Back Guarantee Call:

CUSTOM COMPUTING SOLUTIONS

1122 Millwood Court Orleans, Ontario K1C3G1
(613) 830-3846

CIRCLE 20 ON READER SERVICE CARD

SOFTWARE CONTRACTS

Worried about contracts or handling rights in software? The two volume looseleaf Software Legal Book text and forms can help - from employee agreements through VAR distribution. By software lawyer Paul S. Hoffman. \$180.

Shafer Books, Inc.

P.O. Box 40, Croton-on-Hudson, NY 10520
Tel: (914) 271-6919, Fax (914) 271-5193

CIRCLE 21 ON READER SERVICE CARD

COMMUNICATIONS

The World's Easiest To Use LAN

- Allows sharing of hard drives and printers
- Easy and inexpensive to expand network
- 100% NOVELL compatible hardware
- \$149 for software w/unlimited user license
- Full 30-Day Money Back Guarantee

MAXLAN™

165 San Gabriel Dr., Sunnyvale, CA 94086
Tel: (408) 739-2581 FAX: (408) 720-1102

CIRCLE 22 ON READER SERVICE CARD

COMPUTER LANGUAGES

FORTRAN LANGUAGE SYSTEMS

Editor's Choice & Tech Excellence Winner
Developing on a PC or porting code from a mainframe, we have the compilers.
Starting at \$99. Call 800-548-4778

LAHEY COMPUTER SYSTEMS

BOX 6091 Incline Village, NV 89450
Tel: 702-831-2500 Fax: 702-831-8123

CIRCLE 23 ON READER SERVICE CARD

CONSTRUCTION

Job Cost Accounting Software

CMAS Plus is an integrated job costing, job billing and payroll accounting system designed specifically for mechanical, plumbing and HVAC contractors. Service modules streamline billing and dispatch. Runs on DOS, Novell, UNIX.

DATA-BASICS, INC.

11000 Cedar Road • Cleveland, OH 44106
(216) 721-3400

CIRCLE 24 ON READER SERVICE CARD

DATA BASE

dBASE file access from C, Basic,...

CodeBase 4.5 gives database management capabilities and dBASE, FoxPro or Clipper file compatibility from C, C++, Visual Basic or Pascal for Windows. Full 90 day guarantees. FREE DEMO.

Sequiter Software Inc.

#209, 9644-54 Ave, Edmonton, AB, Can. T6E 5V1
Call (403) 437-2410, Fax (403) 436-2999

CIRCLE 25 ON READER SERVICE CARD

ENTERTAINMENT/GAMES

Go, NEMESIS, Go!

Go-a Zen game. So appealing, it has endured 4,000 years. So useful, governments study it. NEMESIS Go Junior entices novices of any age. NEMESIS Go Master Deluxe satiates the addicted. Chaos Manor Users Choice Award (Byte - 1990)

TOYOGO, Inc.

PO Box 25460-M, Honolulu, HI 96825-0460
(800)869-6469 (808)396-5526 fax: 396-4126

CIRCLE 26 ON READER SERVICE CARD

ADULT VGA SOFTWARE

Stop Paying High Prices for Adult Software! We offer the Best in Adult VGA Software at Lowest Prices. Visa & MasterCard Accepted. Movies, Games, Pictures; 200+ Disks in Stock!
(You must be 21 or older to order.)

CLEARLIGHT SOFTWARE

P.O. Box 1411, Milwaukee, WI 53201
(414) 962-2616

CIRCLE 27 ON READER SERVICE CARD

* SOFTWARES FOR LESS *

Quality Computer Entertainment presents a HUGE collection of GAMES, GRAPHICS, MUSIC, BUSINESS & ADULT programs. High quality only. \$7.95/disk + \$2 S&H. Send \$3 for complete catalog. One disk free on first order. Chk/MO

M. P. Pelletier, Q.C.E.

P.O. Box 8644, Ste-Foy
Quebec Canada, G1V 4N6

CIRCLE 28 ON READER SERVICE CARD

FINANCIAL

Retire A.S.A.P.

Retirement? A little planning can make a big difference. Retire ASAP helps you make your own complete retirement plan. Find out how much you need to save and much more! Interesting & easy-to-use. Investmt guide incl. \$99

Calypso Software Corporation

P.O. Box 3367, Redmond, WA 98073-3367
(800) 225-8246

CIRCLE 29 ON READER SERVICE CARD

FLOW CHART

Windows flowcharter \$129

RFFlow 2.0 is a professional drawing tool for flowcharts and org charts. Requires Microsoft Windows 3.0. 100 shapes auto adjust in size. Diagonal lines and curves. Auto line routing and re-routing. Call for free trial disk.

RFF Electronics

1053 Banyan Court, Loveland, CO 80538
Phone: 303-663-5767 Fax: 303-669-4889

CIRCLE 30 ON READER SERVICE CARD

FOREIGN LANGUAGES

ENGLISH TO FRENCH

State-of-the-art software does basic translation automatically & assists with the more complex. Works from word processor files or keyboard. Easy with pull-down menus, mouse support, etc. \$29.95 + \$5 s&h. Money back guarantee.

Fluentsys Corporation

10451 Mill Run Circle, suite 400
Owings Mills, MD 21117 (800) 243-4470

CIRCLE 31 ON READER SERVICE CARD

GENERAL

Student-Teacher-School SPECIAL

Pagemaker 4.0 \$199-WordPerfect 5.1 \$135-dBase IV \$195-Excel or Word for windows \$189-AmiPro \$99-Lotus windows or v3.1+ \$129-ventura \$199-Borland C++ \$110-Turbo Pascal Pro 6.0 \$120 much more! IBM/MAC Call for Catalog & Details.

PERIPHERALS PLUS, INC.

5016 HWY 9 HOWELL, NJ 07731
800-444-7369 908-363-2424 FAX: 908-363-3687

CIRCLE 32 ON READER SERVICE CARD

Create Software With QuickAuthor™

NO PROGRAMMING! For hypertext, slide shows, animated presentations, tutorials, manuals and demos. Make/capture up to 800 screens, set interaction or auto display details, then save as a standalone. Unique, flexible & easy \$129.

DATACOMPOSE INC.

131 Bloor St. W., #200-175
Toronto, Canada M59 1R8 (416) 921-6082

CIRCLE 33 ON READER SERVICE CARD

GRAPHICS

FRACTAL REALISM FOR CAD & DTP

"Fractal Graphics" lets you design dazzling images and realistic models with your mouse, or use the 200+ examples. Supports .DXF and .PCX files. Here to Super-VGA. On-line help & 160 pp Guide-book teach Chaos and fractals. Only \$79. FREE Info.

Cedar Software

1st Route, Box 5140, Morrisville, VT 05661
(802) 888-5275

CIRCLE 34 ON READER SERVICE CARD

Great Slides and Great Service

Finally....MILLION dollar slides at prices you can afford. Our Economy Service is only \$4. We support most PC and Macintosh applications. Color prints, overheads and scanning service available. Call for free brochure.

GALAXY GRAPHICS, INC.

Office: 703-802-1111 FAX: 703-263-1111
24 Hour Modern Service: 703-643-0329

CIRCLE 35 ON READER SERVICE CARD

35mm SLIDES • OVERHEADS

Vibrant, high-quality output from your PC software. Dozens of software packages supported. Transmit your files anytime. Free reshoots. For free user kit call toll-free 1-800-433-8829

IMAGE CENTER

1011 Second St., S.W. • Roanoke, VA 24016
703-343-8243 • Fax 703-343-0691

CIRCLE 36 ON READER SERVICE CARD

County/Custom Maps + Software

Zoom in/out: Search for streets/intersections. Create overlays/icons. Control Info displayed. Plenty of other features. County/Custom maps Available. Most counties - \$195 - Return in 30 days if not satisfied for full refund.

POLESTAR

1716 Tipton Drive Crofton, MD 21114
301-261-3529

CIRCLE 37 ON READER SERVICE CARD

HEALTH

Nutrition/Medical Diagnosis

The Leader in Nutrition & Exercise Software! Analyzes Recipes, Diets; Auto-Creates Menus. Allergy, Drug, & Differential Diagnosis. Veterinary Diagnosis & Animal Nutrition. Over 100,000 sold. IBM & MAC. Call for free demo.

N-Squared Computing

3040 Commercial Street SE, Suite 240
Salem, OR 97302 (503) 364-9118

CIRCLE 38 ON READER SERVICE CARD

Is your health Important to you?

The Life Fitness System shows what you are missing for a balanced diet. Analyzes & logs nutritious meals. Shows calories burned thru exercise & more! For everyone trying to stay healthy! Perfect Xmas gift! Just 29.95 + 4.95 S/H

NUTRI-SOFT INC.

P.O. Box 756 Princeton Jct., N.J. 08550
Tel: 1-800-835-2246 Ext. 262

CIRCLE 39 ON READER SERVICE CARD

Top-Rated Nutrition Programs!

Analyze diets, recipes, menus. Over 50 easy to use functions. 2400 to 10,000 foods. Tens of 1000's satisfied users. Affordable. FREE Demo Disk!

ESHA Research

POB 13028, Salem, OR 97309
503-585-6242 fax: 503-585-5543

CIRCLE 40 ON READER SERVICE CARD

INVENTORY

dFELLER Inventory

Business inventory programs written in modifiable dBASE source code. dFELLER Inventory \$150, dFELLER PLUS \$200 with History and Purchase Orders (Good for Stockrooms) Requires dBASE III PLUS, or dBASE IV.

Feller Associates

550 CR PPA, Route 3 Ishpeming, MI 49849
906-486-6024

CIRCLE 41 ON READER SERVICE CARD

INVENTORY MANAGEMENT

Stock-Master 4.0, com. grade system, has Stock Status Rptg, PO Write & Track, Trend Analysis, QC Rptg, Trans Hist Detail Analysis, Multi Loc support, BOM, Matl Req Planning, Serial/Lot No Track, Quote/Ord/Inv Prep.

Applied Micro Business Systems, Inc.

177F Riverside Ave., Newport Beach, CA 92663
714-759-0582

CIRCLE 42 ON READER SERVICE CARD

MANUFACTURING

Over 3000 Satisfied Users!

Mfg. inventory control, multi-level BOMs, and integrated purchasing. BOM-driven transfers with full explosion/implosion. \$1495 with money-back guarantee. Informative demo disk prints sample reports - just \$5 (V/M/A accepted).

Microcomputer Specialists, Inc.

P.O. Box 795, Woodstock, Vermont 05091
Call toll free 1-800-833-1500

CIRCLE 43 ON READER SERVICE CARD

MEDICAL

Medical / Dental Systems

Fifteen years of practice management systems with paper and electronic claims, Superbill, patient ledgers, practice analysis, financial histories, appointments, diagnostic data base and more. FREE information, 619-365-9718.

CMA

55888 Yucca Trail Yucca Valley, CA 92284
FAX: 619-228-1567

CIRCLE 44 ON READER SERVICE CARD

PREVENTIVE MAINTENANCE

FLEET/EQUIP MAINTENANCE

A preventative maintenance & report system for vehicles/equip that need periodic service. Some features: Scheduled service reports, Service history, Full operating cost reports, User defined codes, Cost per mile/hour reports.

Ram Systems, Inc.

224 Causeway Blvd., La Crosse, WI 54603
(608) 782-8130 FAX: (608) 784-5115

CIRCLE 46 ON READER SERVICE CARD

PROGRAMMERS TOOLS

Attention Visual Basic™ Users!

ButtonTool creates "VISUAL" Buttons. EditTool creates formatted input fields. VBase/x allows use of dBase files. BT & ET are \$49.95 + \$4 s&h each. VBase/x is \$149.95 + \$10 s&h. All three for \$229.95 + \$15 s&h. No royalties. V/MC/A/COD.

OUTRIDER SYSTEMS, INC.

3701 Kirby Drive Suite 1196 Houston, TX 77098
800-845-0386 FAX 713-523-0386

CIRCLE 47 ON READER SERVICE CARD

BASIC PROGRAMMING TOOLS

Crescent offers many tools for QuickBASIC, PDS, and Visual Basic, all with tutorials and full source. Assembly routines, graphics, screen design w/data entry, BASIC TSR's, and much more. No royalties. Call or write for our catalog.

Crescent Software

32 Seventy Acres, W. Redding, CT 06896
Orders: 800-35-BASIC, Tech: 203-438-5300

Fast Data Management for BASIC!

db/LIB Database Library adds real database management to your MS BASIC PDS or QuickBASIC programs. Reads and writes dBASE III DBF and NDX files. Includes 12 ready-to-run programs. For QB - \$99, PDS - \$189, Networks - \$575.

AJS Publishing, Inc.

P.O. Box 83220, Los Angeles, CA 90083
(800) 992-3383 (213) 215-9145

CIRCLE 49 ON READER SERVICE CARD

Database Engine of the Future

•32 Bit Self-Balancing B-Tree •Runs in protect & unprotect mode •Designed exclusively for 32 bit environment •Compiled in High-C © •Addresses up to 4 gigabytes of memory •\$99.95 (No Royalty) MC/VISA/COD (30 day guarantee)

Technical Assistance Group

753 Broad, Ste 602, Augusta, GA 30901
Tech Support (800) 238-2358

Powerful Turbo Pascal Tools

Libraries from TurboPower help you develop Turbo Pascal applications easier and faster. Expert say "An Essential Toolkit", "Outstanding". OOP and non OOP libraries, BTree, Async and more. Call or write for a FREE brochure.

TurboPower Software

P.O. 49009 Colorado Springs, CO 80949-9009
(800) 333-4160, FAX (719) 260-7151

CIRCLE 50 ON READER SERVICE CARD

MARKETING POWER

Is yours when you place your message in this space. Reach 800,000+ buyers of all kinds of PC products. Give your business card PC Magazine Marketplace Power.

BusinessCard

Call Richard Wortman today.
1-800-825-4237

CIRCLE 51 ON READER SERVICE CARD



READER SERVICE CARD FREE INFORMATION

IT'S AS EASY AS 1, 2, 3

1. Check off your answers to the three research questions

2. Circle the numbers on the card that correspond to the ads or articles you'd like more information about

3. The literature will be mailed to you from the advertiser free of charge

Valid after April 30, 1992

CIRCLE FOR FREE INFORMATION

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40												
41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92
93	94	95	96	97	98	99	100	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129	130	131	132	133	134	135	136	137	138	139	140	141	142	143	144
145	146	147	148	149	150	151	152	153	154	155	156	157	158	159	160	161	162	163	164	165	166	167	168	169	170	171	172	173	174	175	176	177	178	179	180	181	182	183	184	185	186	187	188	189	190	191	192	193	194	195	196
197	198	199	200	201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219	220	221	222	223	224	225	226	227	228	229	230	231	232	233	234	235	236	237	238	239	240	241	242	243	244	245	246	247	248
249	250	251	252	253	254	255	256	257	258	259	260	261	262	263	264	265	266	267	268	269	270	271	272	273	274	275	276	277	278	279	280	281	282	283	284	285	286	287	288	289	290	291	292	293	294	295	296	297	298	299	300
301	302	303	304	305	306	307	308	309	310	311	312	313	314	315	316	317	318	319	320	321	322	323	324	325	326	327	328	329	330	331	332	333	334	335	336	337	338	339	340	341	342	343	344	345	346	347	348	349	350	351	352
353	354	355	356	357	358	359	360	361	362	363	364	365	366	367	368	369	370	371	372	373	374	375	376	377	378	379	380	381	382	383	384	385	386	387	388	389	390	391	392	393	394	395	396	397	398	399	400	401	402	403	404
405	406	407	408	409	410	411	412	413	414	415	416	417	418	419	420	421	422	423	424	425	426	427	428	429	430	431	432	433	434	435	436	437	438	439	440	441	442	443	444	445	446	447	448	449	450	451	452	453	454	455	456
457	458	459	460	461	462	463	464	465	466	467	468	469	470	471	472	473	474	475	476	477	478	479	480	481	482	483	484	485	486	487	488	489	490	491	492	493	494	495	496	497	498	499	500	501	502	503	504	505	506	507	508
509	510	511	512	513	514	515	516	517	518	519	520	521	522	523	524	525	526	527	528	529	530	531	532	533	534	535	536	537	538	539	540	541	542	543	544	545	546	547	548	549	550	551	552	553	554	555	556	557	558	559	560
561	562	563	564	565	566	567	568	569	570	571	572	573	574	575	576	577	578	579	580	581	582	583	584	585	586	587	588	589	590	591	592	593	594	595	596	597	598	599	600	601	602	603	604	605	606	607	608	609	610	611	612
613	614	615	616	617	618	619	620	621	622	623	624	625	626	627	628	629	630	631	632	633	634	635	636	637	638	639	640	641	642	643	644	645	646	647	648	649	650	651	652	653	654	655	656	657	658	659	660	661	662	663	664
665	666	667	668	669	670	671	672	673	674	675	676	677	678	679	680	681	682	683	684	685	686	687	688	689	690	691	692	693	694	695	696	697	698	699	700	701	702	703	704	705	706	707	708	709	710	711	712	713	714	715	716
717	718	719	720	721	722	723	724	725	726	727	728	729	730	731	732	733	734	735	736	737	738	739	740	741	742	743	744	745	746	747	748	749	750	751	752	753	754	755	756	757	758	759	760	761	762	763	764	765	766	767	768
769	770	771	772	773	774	775	776	777	778	779	780	781	782	783	784	785	786	787	788	789	790	791	792	793	794	795	796	797	798	799	800	801	802	803	804	805	806	807	808	809	810	811	812	813	814	815	816	817	818	819	820
821	822	823	824	825	826	827	828	829	830	831	832	833	834	835	836	837	838	839	840	841	842	843	844	845	846	847	848	849	850	851	852	853	854	855	856	857	858	859	860	861	862	863	864	865	866	867	868	869	870	871	872
873	874	875	876	877	878	879	880	881	882	883	884	885	886	887	888	889	890	891	892	893	894	895	896	897	898	899	900	901	902	903	904	905	906	907	908	909	910	911	912	913	914	915	916	917	918	919	920	921	922	923	924
925	926	927	928	929	930	931	932	933	934	935	936	937	938	939	940	941	942	943	944	945	946	947	948	949	950	951	952	953	954	955	956	957	958	959	960	961	962	963	964	965	966	967	968	969	970	971	972	973	974	975	976
977	978	979	980	981	982	983	984	985	986	987	988	989	990	991	992	993	994	995	996	997	998	999	1000																												

1. Do you work in a DP/MIS department?
01. ☐ Yes 02. ☐ No

2. Please indicate your company or organization's primary business activity: (Check one only)

- 01. ☐ Manufacturer of Computer Equipment, Computers, Software
- 02. ☐ Manufacturer—Aerospace
- 03. ☐ Manufacturer—Other
- 04. ☐ Systems House
- 05. ☐ Computer Consultant
- 06. ☐ Computer Retailer/VAR/VAD Distributor
- 07. ☐ Communications
- 08. ☐ Finance/Banking/Insurance/Real Estate/Accounting
- 09. ☐ Education
- 10. ☐ Government—Federal
- 11. ☐ Government—Non-Federal
- 12. ☐ Research and Development
- 13. ☐ Data Processing/Computer Service
- 14. ☐ Health/Medical/Legal Service
- 15. ☐ Engineering/Architecture

16. ☐ Agriculture/Construction/Mining/Oil/Transportation/Utilities

- 17. ☐ Non-Computer Retailer/Distributor
- 18. ☐ Other Business or Service
- 99. ☐ Other

3. Please indicate your primary business function: (Check one only)

- 01. ☐ DP/MIS
- 02. ☐ Systems, Programming
- 03. ☐ Communications
- 04. ☐ Engineering
- 05. ☐ Res./Dev./Scientific
- 06. ☐ Accounting/Finance
- 07. ☐ Computer Consulting
- 08. ☐ Purchasing
- 09. ☐ Operations
- 10. ☐ Production
- 11. ☐ Education/Training
- 12. ☐ Marketing/Sales
- 13. ☐ Medical/Legal
- 14. ☐ Admin./Mgmt.
- 99. ☐ Other

Please print

Name _____

Title _____ Phone () _____

Company _____

Address _____

City _____ State _____ Zip _____

Signature _____ Date _____

☐ Please send me one year (22 issues) of PC Magazine for \$29.97. Offer valid in U.S. only.

Free Product Information

BUSINESS REPLY MAIL

FIRST CLASS MAIL PERMIT NO. 433 RIVERTON, NJ

POSTAGE WILL BE PAID BY ADDRESSEE



P.O. BOX 1687
RIVERTON, NJ 08077-9687

NO POSTAGE
NECESSARY
IF MAILED
IN THE
UNITED STATES



Free Product Information

BUSINESS REPLY MAIL

FIRST CLASS MAIL PERMIT NO. 433 RIVERTON, NJ

POSTAGE WILL BE PAID BY ADDRESSEE



P.O. BOX 1687
RIVERTON, NJ 08077-9687

NO POSTAGE
NECESSARY
IF MAILED
IN THE
UNITED STATES



READER SERVICE CARD FREE INFORMATION

IT'S AS EASY AS 1, 2, 3

1. Check off your answers to the three research questions.

2. Circle the numbers on the card that correspond to the ads or articles you'd like more information about.

3. The literature will be mailed to you from the advertiser free of charge.

CIRCLE FOR FREE INFORMATION

Valid after April 30, 1992

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40
41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92
93 94 95 96 97 98 99 100 101 102 103 104 105 106 107 108 109 110 111 112 113 114 115 116 117 118 119 120 121 122 123 124 125 126 127 128 129 130 131 132 133 134 135 136 137 138 139 140 141 142 143 144
145 146 147 148 149 150 151 152 153 154 155 156 157 158 159 160 161 162 163 164 165 166 167 168 169 170 171 172 173 174 175 176 177 178 179 180 181 182 183 184 185 186 187 188 189 190 191 192 193 194 195 196
197 198 199 200 201 202 203 204 205 206 207 208 209 210 211 212 213 214 215 216 217 218 219 220 221 222 223 224 225 226 227 228 229 230 231 232 233 234 235 236 237 238 239 240 241 242 243 244 245 246 247 248
249 250 251 252 253 254 255 256 257 258 259 260 261 262 263 264 265 266 267 268 269 270 271 272 273 274 275 276 277 278 279 280 281 282 283 284 285 286 287 288 289 290 291 292 293 294 295 296 297 298 299 300
301 302 303 304 305 306 307 308 309 310 311 312 313 314 315 316 317 318 319 320 321 322 323 324 325 326 327 328 329 330 331 332 333 334 335 336 337 338 339 340 341 342 343 344 345 346 347 348 349 350 351 352
353 354 355 356 357 358 359 360 361 362 363 364 365 366 367 368 369 370 371 372 373 374 375 376 377 378 379 380 381 382 383 384 385 386 387 388 389 390 391 392 393 394 395 396 397 398 399 400 401 402 403 404
405 406 407 408 409 410 411 412 413 414 415 416 417 418 419 420 421 422 423 424 425 426 427 428 429 430 431 432 433 434 435 436 437 438 439 440 441 442 443 444 445 446 447 448 449 450 451 452 453 454 455 456
457 458 459 460 461 462 463 464 465 466 467 468 469 470 471 472 473 474 475 476 477 478 479 480 481 482 483 484 485 486 487 488 489 490 491 492 493 494 495 496 497 498 499 500 501 502 503 504 505 506 507 508
509 510 511 512 513 514 515 516 517 518 519 520 521 522 523 524 525 526 527 528 529 530 531 532 533 534 535 536 537 538 539 540 541 542 543 544 545 546 547 548 549 550 551 552 553 554 555 556 557 558 559 560
561 562 563 564 565 566 567 568 569 570 571 572 573 574 575 576 577 578 579 580 581 582 583 584 585 586 587 588 589 590 591 592 593 594 595 596 597 598 599 600 601 602 603 604 605 606 607 608 609 610 611 612
613 614 615 616 617 618 619 620 621 622 623 624 625 626 627 628 629 630 631 632 633 634 635 636 637 638 639 640 641 642 643 644 645 646 647 648 649 650 651 652 653 654 655 656 657 658 659 660 661 662 663 664
665 666 667 668 669 670 671 672 673 674 675 676 677 678 679 680 681 682 683 684 685 686 687 688 689 690 691 692 693 694 695 696 697 698 699 700 701 702 703 704 705 706 707 708 709 710 711 712 713 714 715 716
717 718 719 720 721 722 723 724 725 726 727 728 729 730 731 732 733 734 735 736 737 738 739 740 741 742 743 744 745 746 747 748 749 750 751 752 753 754 755 756 757 758 759 760 761 762 763 764 765 766 767 768
769 770 771 772 773 774 775 776 777 778 779 780 781 782 783 784 785 786 787 788 789 790 791 792 793 794 795 796 797 798 799 800 801 802 803 804 805 806 807 808 809 810 811 812 813 814 815 816 817 818 819 820
821 822 823 824 825 826 827 828 829 830 831 832 833 834 835 836 837 838 839 840 841 842 843 844 845 846 847 848 849 850 851 852 853 854 855 856 857 858 859 860 861 862 863 864 865 866 867 868 869 870 871 872
873 874 875 876 877 878 879 880 881 882 883 884 885 886 887 888 889 890 891 892 893 894 895 896 897 898 899 900 901 902 903 904 905 906 907 908 909 910 911 912 913 914 915 916 917 918 919 920 921 922 923 924
925 926 927 928 929 930 931 932 933 934 935 936 937 938 939 940 941 942 943 944 945 946 947 948 949 950 951 952 953 954 955 956 957 958 959 960 961 962 963 964 965 966 967 968 969 970 971 972 973 974 975 976
977 978 979 980 981 982 983 984 985 986 987 988 989 990 991 992 993 994 995 996 997 998 999 1000

PC 12/31-6

1. Do you work in a DP/MIS department?
01. ☐ Yes 02. ☐ No
2. Please indicate your company or organization's primary business activity: (Check one only.)
01. ☐ Manufacturer of Computer Equipment, Computers, Software
02. ☐ Manufacturer—Aerospace
03. ☐ Manufacturer—Other
04. ☐ Systems House
05. ☐ Computer Consultant
06. ☐ Computer Retailer/VAR/VAD Distributor
07. ☐ Communications
08. ☐ Finance/Banking/Insurance/Real Estate/Accounting
09. ☐ Education
10. ☐ Government—Federal
11. ☐ Government—Non-Federal
12. ☐ Research and Development
13. ☐ Data Processing/Computer Service
14. ☐ Health/Medical/Legal Service
15. ☐ Engineering/Architecture
16. ☐ Agriculture/Construction/Mining/Oil/Transportation/Utilities
17. ☐ Non-Computer Retailer/Distributor
18. ☐ Other Business or Service
99. ☐ Other
3. Please indicate your primary business function: (Check one only.)
01. ☐ DP/MIS
02. ☐ Systems, Programming
03. ☐ Communications
04. ☐ Engineering
05. ☐ Res./Dev./Scientific
06. ☐ Accounting/Finance
07. ☐ Computer Consulting
08. ☐ Purchasing
09. ☐ Operations
10. ☐ Production
11. ☐ Education/Training
12. ☐ Marketing/Sales
13. ☐ Medical/Legal
14. ☐ Admin./Mgmt.
99. ☐ Other

Please print

Name _____

Title _____ Phone () _____

Company _____

Address _____

City _____ State _____ Zip _____

Signature _____ Date _____

☐ Please send me one year (22 issues) of PC Magazine for \$29.97 Offer valid in U.S. only.

PROGRAMMERS TOOLS

QB/PDS/Visual Basic Tools

We offer the best assortment of add-on products. Our specialty is easy-to-use assembler routines to make your programs smaller & faster, TSR's, communications and productivity tools to save you time. No royalties.

MicroHelp, Inc.

4636 Huntridge Drive, Roswell, GA 30075-2012
(800) 922-3383 (404) 594-1185

CIRCLE 52 ON READER SERVICE CARD

REAL ESTATE

PROPERTY MANAGEMENT

Since 1978 over 7,500 users of our software have found it comprehensive, flexible & easy to use. We offer systems to manage: Commercial/Residential/Condominium/Homeowners/Assoc./M-Ini-Storage Facilities. For info. & prices call:

REALTY AUTOMATION

11365 East Shore Drive, Hayden Lake, ID 83835
(208) 772-3259

FASTER LOAN/APR ANALYSIS

One page shows equity, max encumbrance, gross loan, PFC/other chrgs, payoffs, net proceeds, monthly pmt, late chrg, total pmts, balloon, APR, ratios and much more — all IAW Reg Z. 287/387 math coprocessor required. Only \$149

Softwright Systems

P.O. Box 745 West Covina, CA 91793
818-338-6145

CIRCLE 54 ON READER SERVICE CARD

The Landlord® & The Landmaster®

Property management software purchased by more than 5,000 owners and property managers since 1980. Handles residential and commercial tenant accounting: prints checks and statements. G/L and A/P included. From \$595 to \$2200.

The Landlord Software Center

427 East Patrick Street, Dept. E
Frederick, MD 21701 (301) 695-1544

CIRCLE 55 ON READER SERVICE CARD

PROPERTY MANAGEMENT

Rental-Ease. State of the art software for managing income properties of all types. Fast and easy to use. Tracks tenants, income and expense, maintenance and repairs. GL. \$695 complete. Free brochure, demo \$10.

STRATEGIC OFFICE SYSTEMS

688 N. 500 W. #61, Mt. Pleasant, UT 84647
800-942-6784 or 801-462-2130

CIRCLE 56 ON READER SERVICE CARD

Property Management

Software for managing residential, commercial, condos, etc. Basic version for owner/manager. \$495. Deluxe for professional managers. \$1,195. Network-\$2,395. Includes check writing, recurring expenses, G/L, management reporting.

YARDI SYSTEMS, INC.

819 Reddick Street, Santa Barbara, CA 93103
(805) 966-3666

CIRCLE 57 ON READER SERVICE CARD

RELIGION

Bible Study Software

For 10 years we have remained the leading Bible study software company. Think of us as a Bible bookstore with an integrated family of software products for your Bible study needs! Call for a FREE catalog!

Bible Research Systems

2013 Wells Branch Pkwy. #304 Austin, TX 78728
1-800-423-1228 1-512-251-7541

SALES MARKETING

SALES ALLY Software

• PC Magazine Editors' Choice • PC Computing "Best Product" • Mobile Office Mag Annual Award Client & Prospect Management Database, Wordprocessor, & Notepad Autodialing, Reports, Alarms Invoicing, Sales Forecasting, Networks

SCHERRER RESOURCES, INC.

8100 Cherokee Street Philadelphia, PA 19118
215-836-1830, \$395, (Visa/MC/Amex)

CIRCLE 58 ON READER SERVICE CARD

SCIENTIFIC

SCIENTIFIC ACCELERATOR

25 MegaFLOP Floating Point Array Processor with 256K+ static memory. Easily programmed by calling 598 routines from your C, FORTRAN, or Pascal PC programs. 512x512 FFT 1.18 secs. Single slot board with software: \$2,495.00.

EIGHTEEN EIGHT LABORATORIES

1247 Tamarisk, Boulder City, NV 89005
Tel: 800-888-1119. Fax: 702-294-2611

CIRCLE 60 ON READER SERVICE CARD

STATISTICS

Statistical Advisor Speaks English!

Statistical Navigator Professional™ lets you describe your research goal in plain english, guides you to the appropriate statistical analysis. Natural language interface, detailed report, extensive hypertext help, & pull-down menus.

The Idea Works, Inc.

607 Jackson St., Columbia, MO 65203
800-537-4866/314-875-5827/Fax 314-875-5812

CIRCLE 61 ON READER SERVICE CARD

NCSS 5.x Series - \$125

"Best value & easiest to learn/use" PC-Week. Menus/Spreadsheet. Means, etc. Regression, t-tests, ANOVA. Factor, cluster & discriminant. Cross tabs. Nonparametrics. Histograms. Plots. Reads ASCII/Lotus. Many extra modules.

NCSS

329 North 1000 East, Kaysville, UT 84037
Phone: 801-546-0445 FAX: 801-546-3907

CIRCLE 62 ON READER SERVICE CARD

SURVEYS

#1 In Surveys - StatPac Gold IV

Professional's choice for survey & marketing research. User-friendly, comprehensive & dependable. Camera ready tables & graphics. Basic & advanced statistics. CRT & telephone interviewing. Easiest to learn. Guaranteed.

StatPac Inc.

3814 Lyndale Ave. S., Mpls., MN 55409
Tel: (612) 822-8252 Fax: (612) 822-1708

CIRCLE 63 ON READER SERVICE CARD

The Survey System

Analyzes market research, public opinion, customer satisfaction and employee attitude surveys. Easy to learn and use. Produces presentation quality tables and graphics. Statistics, verbatim, interviewing and network options.

Creative Research Systems

15 Lone Oak Ctr. - Dept. P, Petaluma, CA 94952
Ph: (707) 765-1001 Fax (707) 765-1068

CIRCLE 64 ON READER SERVICE CARD

UTILITIES

REMOVE HARDWARE LOCKS

Protect your investment! Maintain Productivity! Software utility that allows for the removal of hardware locks. Available for most CAD/CAM & PCB sw programs. Easy - Simple - Guaranteed Programs start at \$99.00 Call or Fax for info.

SafeSoft Systems Inc.

202-1100 Concordia Ave., WPG, Mb, CANADA
R2K 4B8 (204) 669-4639 Fax (204) 668-3566

CIRCLE 65 ON READER SERVICE CARD

Instant Animation and Graphics

Present with Yellow Ribbon, a revolutionary TSR Graphics & Animation during any application! Good news for Dbase, Lotus, 3270 users. Great for presentations, help, archive & much more. No programming, extremely easy, plug & go. Only \$123.

Final Touch Corp.

1723 Hamilton San Jose, CA 95125
Tel: 408-377-7271 Fax: 408-377-7197

CIRCLE 66 ON READER SERVICE CARD

DOS BOSS™

Menu Generator, DOS Command Shell, File Manager, Usage Log, DOS 2.1 +, Non TSR, Minimal memory required, Easiest to use DOS utility or your money back! \$39.95 + \$4 S/H, AMEX/MC/VISA

RGJ SYSTEMS

2255 N Univ Pkwy #15, Provo, UT 84604
801-225-8098 Orders: 800-336-6644

CIRCLE 67 ON READER SERVICE CARD

WINDOWS

Pinpoint PC Bottlenecks

- Personal Measure shows how apps spend time.
- Upgrade or replace PCs based on hard facts.
- Identify network trouble spots.
- Resolve app problems using our services.
- \$125 + S&H (5.25" or 3.5") MC/VISA

SPIRIT OF PERFORMANCE, INC.

73 Westcott Road, Harvard, MA 01451
tel. 508/456-3889, telex 6503571400

CIRCLE 68 ON READER SERVICE CARD

What's Windows 3.0 Missing ???

WinPrint - easy way to print ASCII files to any printer. Print 1 or many files. Pick files, press PRINT. Flexible formatting: headers, margins, fonts, orientation. File viewer. Also uses Windows 3.1 Drag&Drop! \$79+s&h. \$10 Demo.

Non-Causal Systems, Inc

4691 N. University Drive, Suite 384
Coral Springs, FL 33067 1-(800) 221-9423

CIRCLE 69 ON READER SERVICE CARD

WINDOWS

NCOMPASS FOR WINDOWS

Create sophisticated multi-layered maps or buy high quality NCompass Ready-Mades. Zoom, query graphical data, pinpoint addresses, track distances. Much more. Extensive manual. Software \$50 City, County, State maps \$20-\$50

3CS Software

P.O. Box 8331 Chicago, IL 60680-8331
(312) 271-1020

CIRCLE 70 ON READER SERVICE CARD

BAR CODING

Labeling & Barcoding Software

WYSIWYG design/Built-in data base w/file import / Scalable fonts / Many barcodes / Variable code densities, ratios, heights / Batch printing / PCX image support/Dot matrix, laser, thermal printers / \$259 and up.

LabelSoft™

P.O. Box 488, Perrysburg, OH 43552
(419) 874-8502 FAX (419) 874-9313

CIRCLE 73 ON READER SERVICE CARD

SERVICES

GRAPHICS SCANNING SERVICE

Any LOGO/ART CONVERTED to graphics image! Send camera ready art or clear crisp copy. Choose WordPerfect, TIFF or PCX format & DS/DD disk size (5.25or3.5). WP5.1 Letterhead/Envelope Macro & S/H INCLUDED! Send \$25.00 per image:

SCANIT

5405 Alton Parkway, Suite 5A441
Irvine, CA 92714 714/559-0821

CIRCLE 76 ON READER SERVICE CARD

BOOKS/CATALOGUES

Cast a Spell with WindowMagic

Custom Icons for Minimized Program Groups? MS sez NO WAY! WindowMagic sez OK!

- * Change Group and Program Icons Easily
 - * Includes Over 500 Icons
- Only \$39.95 plus \$3.00 shipping/handling from

WindowWear

401 N.E. Ravenna Blvd. Ste 144 Seattle, WA 98115 Orders: 800-551-1755 VISA/MC/COD

CIRCLE 71 ON READER SERVICE CARD

Micro Moonlighter Newsletter

The ORIGINAL resource and idea publication for the computer entrepreneur. Each and every issue has only one goal ... to make you a success in your own business...at home...with your computer as the focus. No get-rich-quick hype.

The Technical Group

Ste. B-1, 4545 Industrial Dr., Spgld, IL 62703
Phone: (217)585-3456 Fax:(217)585-0164

CIRCLE 74 ON READER SERVICE CARD

TRAINING/TUTORIALS

INTRO TO PERSONAL COMPUTERS

- * A Tutorial Program for Novices & Professionals.
 - * Includes Text, Windows, Graphics, & much more.
 - * Runs on a PC with Hard Disk & 5 1/4" Diskette.
- Only \$89 + \$4 s&h. VISA, M/C or Send Check to:

TECH-LORE CORPORATION

8086 S. Yale Ave., Suite 102, Tulsa, OK 74136
800-568-4727

CIRCLE 77 ON READER SERVICE CARD

MISCELLANEOUS/ACCESSORIES

NEW BBS ONLINE...NOW!

Do you have anything that you would like to buy or sell? Then get "Online" to the easiest to use BBS devoted 100% to classified advertising. Free to browse. No monthly service charges, signup fees, etc. Free auto dial-in software.

Online Electronic Classifieds

PO Box 988, Plattsburgh, NY 12901
Modem 518-562-9452 (N,8,1)

CIRCLE 72 ON READER SERVICE CARD

DISKETTE COPY SERVICES

DUPLICATE DISKS FAST!

DiskDupe copies 2 to 6 times faster than DOS! Reads master once, makes unlimited copies. Stores images on hard disk. Pull-down menus. Automatically formats. 5", 3", high-density. Only \$79. Money Back Guarantee!

MICRO SYSTEM DESIGNS, INC.

4962 El Camino, Suite 204, Los Altos, CA 94022
(415) 964-2844 Fax: (415) 964-4529

CIRCLE 75 ON READER SERVICE CARD

CONSULTANTS/TECHNICIANS

Work for yourself! No investment needed! Sale and service leads provided. All hardware and operating systems! Any certifications are a plus but not necessary! All areas needed! We provide complete kit with approval of a

LCOMPUTE NATIONAL SERVICE

39 West 74th St. Suite 1B, NY, NY 10023
800-788-5818

CIRCLE 78 ON READER SERVICE CARD



PC MAGAZINE MARKETPLACE

One Park Avenue
Third Floor
New York, NY 10016
Att.: Vickie L. Pinsky

For more advertising
information,
call 212-503-5115
or 1-800-825-4237.

ADVERTISING ACCOUNT REPRESENTATIVES

Sr. Account Representative
Charles Boyar 212-503-5118
CA (415, 510, 619, 818)

Sr. Account Representative
Kathleen Morris 212-503-5125
AZ, CA (209, 707), CO, ID, MO, NV,
OH, OR, WA, CANADA, OVERSEAS

Louella Dizon 212-503-5145
AR, CT, GA, ME, NC, NH, NJ, PA,
RI, SC, VT

Margaret Kennelly 212-503-5176
IA, IL, IN, KS, MI, MT, NE, NY,
UT, WY

Mike Medwig 212-503-5193
CA (714, 805, 916), FL, MA, MN,
ND, NM, SD, WI

212-503-5117
CA (213, 408), HI

212-503-5156
AL, DC, DE, KY, LA, MD, MS, OK,
TN, TX, VA, WV

BusinessCard
Account Representative
Richard Wortman 212-503-5175

NATIONAL ADVERTISING STAFF

Vice President,
Classified Advertising
Paul Stafford

Classified Advertising Director
Vickie L. Pinsky

Sr. Advertising Coordinator
Wanda D. Brown

Production Director
Anne Brockinton

Production Supervisor
Bessi Dion

Production Coordinator
Mary C. Murawinski

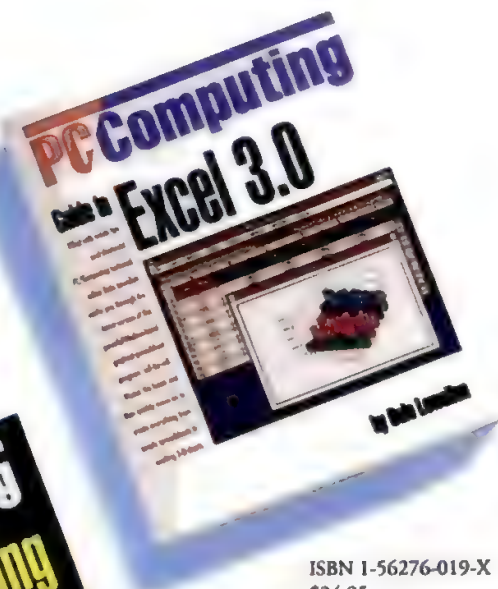
Some Of The Industry's Best Magazine Writers Are Now Writing Some Of The Industry's Best Books.



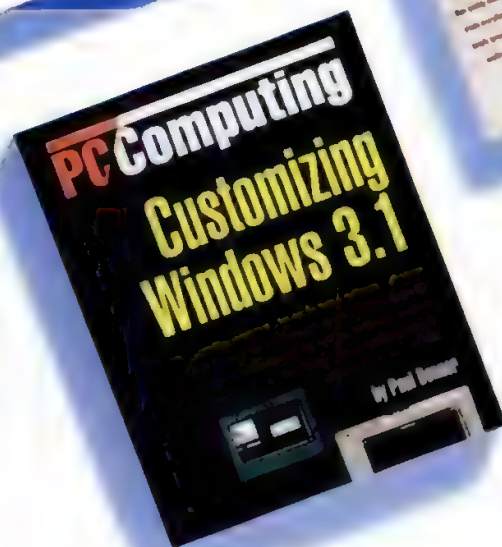
ISBN 1-56276-036-X
\$34.95



ISBN 1-56276-023-8
\$24.95



ISBN 1-56276-019-X
\$24.95



ISBN 1-56276-018-1
\$34.95
Available April 1992

The senior writers and editors of *PC/Computing* have earned a reputation for their expertise on application software. Now these writers have joined forces with Ziff-Davis Press to create a new series of computer books designed to give you the inside track on today's key applications.

They're filled with expert tips and secrets you can't find anywhere else. All are designed to be easy to read and apply. And many include utilities on disk to further boost your productivity.

When you're ready to work smarter--not harder--look for the *PC/Computing* books from Ziff-Davis Press. Available at booksellers or call

1-800-688-0448



© 1991 Ziff-Davis Press, 5903 Christie Avenue, Emeryville, CA 94608



ADVERTISING SALES STAFF

One Park Avenue, New York, NY 10016
(212) 503-5100

DISPLAY ADVERTISING

NATIONAL

Nancy Newman -
National Advertising Director
(212) 503-5204

Sales Manager
Michael Hatherill
(212) 503-5128

Ad Systems Supervisor
Allyson Deane
(212) 503-5044

Sr. Advertising Coordinator
Christine Holsten
(212) 503-5264

Advertising Coordinator
Lynette Stiffa
(212) 503-5107

EASTERN

Al Di Guido - Associate
Publisher/East Coast
(212) 503-5310

MA, NH, VT, ME, RI

District Manager
Kimberly Rene White
(617) 393-3055
10 President's Landing, Mystic
Central
Medford, MA 02155
Sr. Account Representative
Todd Anderman
(212) 503-5132

CT, NY, NJ, PA

District Manager
Michael Bird
(212) 503-5307
District Sales Representative
Lisa Friedman
(212) 503-5149
One Park Avenue, 4th Floor
New York, NY 10016
Sr. Account Representative
Joyce Wasserman
(212) 503-5333
Sr. Account Representative
Stephanie Brzozowski
(212) 503-5675

DE, MD, DC, VA, WV, NC, SC, AL,
MS, TN, AR, KY, GA, FL

District Manager
Scott J. Seltz
3405 Piedmont Road, Suite 460
Atlanta, GA 30305
(404) 239-9780

Account Representative
Andrew Jacobs
(212) 503 5130

CENTRAL

Robert Diftler - Central
Advertising Manager
(312) 346-7666

NE, WI, IL, IN, KS, MN, MO, OH,
MI, IA, ND, SD, Canada

District Manager
Stephen Dress
District Manager
Jay Overbye
150 North Wacker Drive, 25th Floor
Chicago, IL 60606
(312) 346-7666
Account Representative
Maureen Dooley
(212) 503-5126
Sr. Account Representative
Beth Boyle
(212) 503-5047

TX, OK, LA, NM

District Manager
Paul Klein
5956 Sherry Lane, Suite 625
Dallas, TX 75225
(214) 691-6934
Account Representative
Karen Keavey
(212) 503-5104

WESTERN

CA (Los Angeles)

District Manager
Mary Arlotto (213) 351-1811
3530 Wilshire Boulevard, Suite 645
Los Angeles, CA 90010
(213) 351-1810
Account Representative
John DeSpirito
(212) 503-5040

WESTERN

Ted Welch - Associate
Publisher/West Coast
(415) 378-5525

CA (San Francisco & North), ID,
OR, WA

District Manager
Mike Kisseberth
(415) 378-5527
District Sales Representative
Rick Vandervoorn (415) 378-5523
110 Marsh Drive, Suite 103
Foster City, CA 94404
Account Representative
Chris Sullivan
(212) 503-5129

CA (Santa Barbara to South San
Francisco), WY, MT, AK, CO, UT

District Manager
Michael Klein (415) 378-5521
District Manager
Kim Dawson (415) 378-6859
110 Marsh Drive, Suite 103
Foster City, CA 94404
(415) 378-5520
Account Representative
John Zaterka
(212) 503-5041

CA (San Diego & Orange County),
AZ, NV, HI

District Manager
David Lynn
District Manager
Robin Kofsky
18500 Von Karman Avenue
Suite 510
Irvine, CA 92715
(714) 852-8001
Sr. Account Representative
Molly Shank
(212) 503-5113

For more information
regarding *display*
advertising please call:
(212) 503-5100 or
1-800-33MAG AD

CLASSIFIED ADVERTISING

VP, Classified Advertising
Paul Stafford
Classified Advertising Director
Vickie L. Pinsky
Sr. Advertising Coordinator
Wanda D. Brown
Production Director
Anne Brockinton
Production Supervisor
Bessi Dion
Production Coordinator
Mary C. Murawinski

CA (415, 510, 619, 818)
Sr. Account Representative
Charles Boyar
212-503-5118
AZ, CA (209, 707), CO, ID, MO, NV,
OH, OR, WA, CANADA,
OVERSEAS
Sr. Account Representative
Kathleen Morris
212-503-5125
AR, CT, GA, ME, NC, NH, NJ, PA,
RI, SC, VT
Louella Dizon
212-503-5145

IA, IL, IN, KS, MI, MT, NE, NY, UT,
WY
Margaret Kennelly
212-503-5176
CA (714, 805, 916), FL, MA, MN,
ND, NM, SD, WI
Mike Medwig
212-503-5193
CA (213, 408), HI
212-503-5117
AL, DC, DE, KY, LA, MD, MS, OK,
TN, TX, VA, WV
212-503-5156

Business Card
Account Representative
Richard Wortman 212-503-5175



PC MAGAZINE MARKETPLACE
3rd Floor, One Park Avenue,
New York, NY 10016

For more information
regarding *classified*
advertising please call:
212-503-5115 or
1-800-825-4237

R/S#	ADVERTISER	PAGE	R/S#	ADVERTISER	PAGE	R/S#	ADVERTISER	PAGE
293	3 Com.....	166-167	*	Gateway 2000.....	113-121	145	Paradise Computer Products Ltd.....	429
360	Acma Computers, Inc.....	87	146	Gateway Communications.....	351	*	PC Connection.....	256-261
165	Advanced Logic Research.....	2-3	200	Great Europe-Asia Corp.....	393	497	PC MagNet.....	390
199	Amaze, Inc.....	289	*	Hard Drives International.....	426	*	PC Zones.....	344-347
475	American Small Business.....	63	276	Hauppauge Computer Works, Inc.....	34	358	Peachtree Software.....	254
208	APS Technologies.....	428	388	Hayes Microcomputer Products ..	360	343	Performance Memory Products ..	423
336	Arlington Computer Products.....	419-420	313	Helix Software.....	51	383	Primavera Systems.....	57
254	Artisoft.....	362	262	Hewlett Packard Peripheral Group.....	148-149	119	Programmer's Paradise.....	409
111	ASP Computer Products.....	86	*	IBM Corporation.....	78	259	QMS.....	19
734	AT&T Safari Systems.....	213	514	IBM Corporation.....	137	141	QMS.....	47
337	ATI Technologies Inc.....	92	*	Insight Computers.....	124-125	326	Qualitas.....	176
540	ATI Technologies Inc.....	193	363	Intel Corporation.....	131-133	*	Quill Corp.....	219
509	Austin Computers.....	11-15	512	Intel Corporation.....	188-189	289	Radio Shack.....	72
351	Banner Blue.....	183	*	Intuit Software.....	94-95	290	Rose Electronics.....	73
295	Borland International.....	53-55	228	Invisible Software.....	341	349	S&W Electronics.....	423
287	Borland International.....	185-187	378	Iomega Corporation.....	312	296	SAMTRON.....	28
285	Borland International.....	293	325	IQ Engineering.....	4	*	Scitor Corporation.....	70
188	Brier Technology/Quadram.....	321	127	JDR Microdevices.....	422	*	Seagate.....	323
328	Buffalo Products.....	332	*	JK LASSER.....	263	*	Seiko Instruments-PC Products.....	156-157
481	Bulldog Computer Products.....	427	493	LA Trade.....	430	193	Sharp LCD Division.....	104
522	Calera Recognition Systems.....	311	309	LANtek Computer, Inc.....	421	740	Sierra Semiconductor.....	214
190	CallSoft.....	59	195	Lasermaster.....	165	160	Sigma Data.....	230
169	Canon, USA.....	65	*	Lotus Development Corp.....	203-210	373	Software Add-Ons.....	431
187	Canon, USA.....	191	263	Macola Inc.....	23	731	Stac Electronics.....	82-83
319	Cardinal Technologies.....	234	*	Magnavox.....	357	163	Standard Computer.....	226-227
473	Colorado Memory Systems, Inc.....	81	154	MathSoft Inc.....	18	485/496	StatSoft.....	239
*	CompuAdd.....	301-308	*	Maxell.....	154	*	Swan Technologies.....	325-328
205	Compuclassics.....	416	495	Maynard Electronics.....	60	264	Symantec.....	22
132	COMPU DYNE.....	196-199	339	Microcom.....	43	117	Symantec.....	74
300	Computability.....	417	*	Micrografx.....	171	332	Symantec.....	237
381	Computer Associates.....	6-7	*	Microsoft.....	C2-C4, p1	344	Symantec.....	364
109	Computer Discount Warehouse.....	424-425	*	Microsoft.....	39	177	TechBook.....	320
158	Computer Library.....	402	*	Microsoft.....	231	477	Tektronix.....	200
183	Computer Library.....	470	*	Microsoft.....	233	206	Telemart.....	67-69
729	Corel Systems.....	194	*	Microsoft.....	235	306	Tenex Computer Express.....	430
541	Creative Labs, Inc.....	232	*	Microsoft.....	398	304	Texas Instruments.....	225
142	DataViz.....	253	225	MicroWarehouse Inc.....	266-269	335	Time Solutions.....	474
*	Dataworld.....	31	489	Midwest Computer Works.....	420	168	Toshiba of America.....	127
536	Dell Computer Corporation.....	C5-C8	483	Momenta Corporation.....	108-109	379	Toshiba of America.....	152-153
532	Dell Computer Corporation.....	142-143	283	Nanao, USA Corp.....	163	121	Tri-Star Computer.....	20-21
470	Dell Computer Corporation.....	144-145	153	NEC Technologies, Inc.....	26-27	342	Truevision Inc.....	151
480	Dell Computer Corporation.....	216-217	156	NEC Technologies, Inc.....	40-41	733	ULSI Systems, Inc.....	221
*	Dell Computer Corporation.....	477-478	157	NEC Technologies, Inc.....	84	367	Universal Data Systems.....	406
*	Digital Equipment Corporation.....	317	730	NEC Technologies, Inc.....	172-173	270	Within Technologies.....	384
*	Digital Equipment Corporation.....	319	217	NEC Technologies, Inc.....	337	*	Wordperfect.....	106-107
745	Digital Products.....	174	327	Northgate Computer Systems.....	277	*	Wordperfect.....	138-139
239	Digital Research.....	96	207	Northgate Computer Systems.....	278-279	488	Zeos International.....	24-25
102	DTK Computers.....	291	243	Northgate Computer Systems.....	280-281	721	Zeos International.....	32-33
347	Dustin Discount Software.....	16	243	Northgate Computer Systems.....	282-283	*	Zeos International.....	48a-1
284	EPS Technologies.....	99-101	368	Northgate Computer Systems.....	284	723	Zeos International.....	88-89
479	Ergo Computing Inc.....	223	144	On-Line Computer Systems.....	359	513	Zeos International.....	90
294	ET Valueline.....	414	*	Oracle.....	158	*	Zeos International.....	169
*	Everex.....	228-229	245	Output Technology.....	175	*	Zeos International.....	243-250
*	Everex.....	295-297	*	Pacific Data Products.....	45	115	Zeos International.....	251
352	FASTMICRO.....	410-413	*	Pacific Data Products.....	349	722	Zeos International.....	298
288	Fifth Generation.....	102-103	140	Panasonic Comm. & Systems Co.....	5	494	Ziff Davis Press.....	432
382/320	First Source International.....	415				736	Ziff Davis Press.....	463
112	Fox Software.....	76-77						
323	Funk Software.....	240						

* No Reader Service #. Please Call Advertiser For Information.

ADVERTISERS' INDEX

PRODUCTS BY CATEGORY

R/S# ADVERTISER

PRODUCT

PAGE#

R/S# ADVERTISER

PRODUCT

PAGE#

ACCOUNTING SOFTWARE

263	Macola Inc.	Accounting Software	23
356	Peachtree Software	Family of Accounting Software	254
373	Software Add-Ons	Mail Order	431

DATA BASE MANAGERS

295	Borland International	PDX	53-55
287	Borland International	dBase	185-187
285	Borland International	PDY QPro	293
112	Fox Software	Fox Pro 2.0	76-77
112	Fox Software	Database Manager	76-77
	Oracle	Database	158

FILE TRANSLATION SOFTWARE

142	DataViz	MacLink Plus/PC	253
144	On-Line Computer Systems	OPTI-NET	359

FINANCIAL PLANNING SOFTWARE

	Intuit Software	Quicken Accounting Software	94-95
	JK LASSER	Tax Software	263
335	Time Solutions	MedSure	474

LANGUAGES

	Microsoft	Quick Basic	398
--	-----------	-------------	-----

OPERATING SYSTEMS/ENVIRONMENTS

239	Digital Research	DR DOS	96
386	Hayes Microcomputer Products	LANstep	360

PROGRAM DEVELOPERS/GENERATORS

119	Programmer's Paradise	Mail Order	409
270	Within Technologies	The Realizer	384

PROJECT MANAGEMENT

	Microsoft	Project for Windows	39
383	Primavera Systems	Sure Track Project Scheduler	57
	Solitor Corporation	Project Scheduler	70
117	Symantec	On Target	74
332	Symantec	TimeLine	237

STATISTICAL SOFTWARE

154	MathSoft Inc.	Maple V	18
485/496	StatSoft	Statistical Software	239

UTILITIES

286	Fifth Generation	FastBack Plus 3.0	102-103
323	Funk Software	Sideways	240
313	Helix Software	Netroom	51
119	Programmer's Paradise	Mail Order	409
373	Software Add-Ons	Mail Order	431
264	Symantec	Desktop for Windows	22
344	Symantec	Desktop for Windows	364

WORD PROCESSING SOFTWARE/AIDS

	Lotus Development Corp	Ami Pro 2.0	203-210
373	Software Add-Ons	Mail Order	431
	Wordperfect	Word Processing	106-107
	Wordperfect	Word Processing	138-139

CAD/CAM

475	American Small Business	DesignCAD	63
-----	-------------------------	-----------	----

SPREADSHEET/TEMPLATES

285	Borland International	PDY QPro	293
381	Computer Associates	Compele	6-7
323	Funk Software	Sideways	240
	Lotus Development Corp.	Lotus 1-2-3 for Windows	203-210
373	Software Add-Ons	Mail Order	431

PAYROLL/PERSONNEL

	Intuit Software	Quicken/Accounting Software	94-95
--	-----------------	-----------------------------	-------

TAX SOFTWARE

	JK LASSER	Tax Software	263
--	-----------	--------------	-----

VERTICAL MARKET SOFTWARE

154	MathSoft Inc.	Maple V	18
731	Stac Electronics	Stacker	82-83
485/496	StatSoft	Statistical Software	239

ENTERTAINMENT SOFTWARE

	Microsoft	Flight Simulator	231
	Microsoft	Flight Simulator	233
	Microsoft	Flight Simulator	235

HOME MANAGEMENT SOFTWARE

335	Time Solutions	MedSure	474
-----	----------------	---------	-----

PRESENTATION SOFTWARE

	Lotus Development Corp	Freelance Graphics for Windows	203-210
--	------------------------	--------------------------------	---------

WINDOWS SOFTWARE

351	Banner Blue	Org Plus for Windows	183
381	Computer Associates	Compele	6-7
	Lotus Development Corp.	Lotus 1-2-3 for Windows	203-210
	Lotus Development Corp.	cc: Mail from Lotus	203-210
	Lotus Development Corp.	Ami Pro 2.0	203-210
	Lotus Development Corp.	Lotus Notes	203-210

	Lotus Development Corp		
339	Microcom		
	Microsoft		
	Microsoft		
119	Programmer's Paradise		
270	Within Technologies		

DATA COMPRESSION SOFTWARE

731	Stac Electronics	Stacker	82-83
-----	------------------	---------	-------

ORGANIZATIONAL CHART SOFTWARE

351	Banner Blue	Org Plus for Windows	183
-----	-------------	----------------------	-----

BACKUP SOFTWARE

288	Fifth Generation	FastBack Plus 3.0	102-103
-----	------------------	-------------------	---------

DISK BACKUP & TAPE DRIVES

473	Colorado Memory Systems, Inc	Jumbo Tape Drive	81
378	Iomega Corporation	Bernoulli Box	312
495	Maynard Electronics	MaynStream Tape Backup	60
	Seagate	Drives	323

HARD DISKS

188	Brier Technology/Quadram	Quad Flextra 25Mb Floppy	321
127	JDR Microdevices	Hard Disks	422
731	Stac Electronics	Stacker	82-83

COMPUTERS/COMPATIBLES

360	Acma Computers, Inc	Acma PC's	87
165	Advanced Logic Research	Business VIESA	2-3
336	Arlington Computer Products	Mail Order	419-420
509	Austin Computers	PC's	11-15
481	Bulldog Computer Products	Compables	427
	CompuAdd	PC's	301-308
132	COMPU DYNE	Hardware, Software, Peripherals	196-199
109	Computer Discount Warehouse	Hardware/Software/Peripherals	424-425
	Dataworld	PC's	31
536	Dell Computer Corporation	PC's	C5-C8
532	Dell Computer Corporation	Dell PC's	142-143
470	Dell Computer Corporation	Dell PC's	144-145
480	Dell Computer Corporation	Dell PC's	216-217
	Dell Computer Corporation	Dell PC's	477-478
	Digital Equipment Corporation	Eclipse 433PC	317
	Digital Equipment Corporation	Eclipse 433PC	319
102	DTK Computers	Computers/Compatibles	291
284	EPS Technologies	Compables	99-101
479	Ergo Computing Inc.	PC's	223
294	ET ValueLine	Compables	414
	Everex	Tempo Family	228-229
	Everex	Tempo Family	295-297
352	FASTMICRO	PC's, Compatibles	410-413
	Gateway 2000	Compables	113-121
	IBM Corporation	PS/2	78
	Insight Computers	Computers/Compatibles	124-125
127	JDR Microdevices	Compables	422
309	LANtek Computer, Inc.	PC's	421
	Magnavox	CD-ROM PC	357
730	NEC Technologies, Inc.	Powermate FX/20w	172-173
	Northgate Computer Systems	Compables	277
327	Northgate Computer Systems	Compables	278-279
207	Northgate Computer Systems	Compables	280-281
243	Northgate Computer Systems	Compables	282-283
368	Northgate Computer Systems	Compables	284
145	Paradise Computer Products Ltd	Mail Order	429
	PC Zones	Compables	344-347
	Quill Corp	Compables	219
289	Radio Shack	MultiMedia Computers	72
163	Standard Computer	PCs	226-227
	Swan Technologies	Swan PCs	325-328
206	Telemart	PC's	67-69
306	Tenex Computer Express	Mail Order Memory Products	430
168	Toshiba of America	Notebook	127
379	Toshiba of America	Notebook	152-153
121	Tri-Star Computer	Computers/Compatibles	20-21
488	Zeos International	Compables	24-25
721	Zeos International	Compables	32-33
	Zeos International	Compables	48a-1
723	Zeos International	Compables	88-89
513	Zeos International	Compables	90
	Zeos International	Compables	169
	Zeos International	Zeos Notebook	243-250
115	Zeos International	Z-Card	251
722	Zeos International	Compables	298

PROGRAMMERS TOOLS UTILITIES

119	Programmer's Paradise	Mail Order	409
270	Within Technologies	The Realizer	384

MULTIFUNCTION BOARDS

540	ATI Technologies Inc.	Stereo - F/X	193
541	Creative Labs, Inc.	Sound Blaster	232

ADD-ON BOARDS

208	APS Technologies	Mail Order	428
540	ATI Technologies Inc.	Stereo - F/X	193

ADVERTISERS' INDEX

PRODUCTS BY CATEGORY

R/S#	ADVERTISER	PRODUCT	PAGE#	R/S#	ADVERTISER	PRODUCT	PAGE#
541	Creative Labs, Inc.	Sound Blaster	232	180	Sigma	Data Memory Upgrades	230
276	Hauptpage Computer Works, Inc.	N Series Motherboard	34	306	Tenex Computer Express	Mail Order Memory Products	430
195	Lasermaster	Win Printer	185	TIME MANAGEMENT SOFTWARE			
180	Sigma Data	Add-On-Boards	230	199	Amaze, Inc.	Far Side Calendaring Program	289
342	Truevision Inc.	Video Graphics Boards	151	CD-ROM			
PRINTERS				158	Computer Library	Computer Select	402
169	Canon, USA	BJ300/330 Bubble Jet Printer	65	183	Computer Library	Select Demos	470
187	Canon, USA	Laser Beam Printers	191	*	Magnavox	CD-ROM PC	357
745	Digital Products	Print Director	174	217	NEC Technologies, Inc.	CD-ROM	337
262	Hewlett Packard Peripheral Group	DeskJet C	148-149	144	On-Line Computer Systems	OPTI-NET	359
514	IBM Corporation	Laser Printer	137	CHIPS/PROCESSORS			
195	Lasermaster	Win Printer	165	363	Intel Corporation	486	131-133
245	Output Technology	EuroLine	175	MASS STORAGE			
140	Parasonic Comm. & Systems Co.	Dot Matrix Printer	5	208	APS Technologies	Mail Order	428
259	QMS	PS-815MR Laser Printer	19	188	Brier Technology/Quadram	Quad Flextra 25Mb Floppy	321
141	QMS	PS-2000 Laser Printer	47	*	Hard Drives International	Mass Storage	426
290	Rose Electronics	Printer Sharing Switches	73	495	Maynard Electronics	MaynStream Tape Backup	60
*	Seiko Instruments-PC Products	Printer	156-157	DISPLAYS/MONITORS/TERMINALS			
477	Tektronix	Phaser II Color Printer	200	109	Computer Discount Warehouse	Monitors/Laptops/Modems	424-425
FLOPPY DISK DRIVES				283	Nanao, USA Corp	Monitor	163
188	Brier Technology/Quadram	Quad Flextra 25Mb Floppy	321	153	NEC Technologies, Inc.	MultiSync Monitors	26-27
FONT CARTRIDGES				296	SAMTRON	Monitor	28
325	IQ Engineering	Fonts	4	193	Sharp LCD Division	QA 1050 Projection Panel	104
*	Pacific Data Products	Complete Font Library	349	*	Swan Technologies	Monitors	325-328
PRINTER ACCESSORIES				GRAPHICS SOFTWARE			
328	Buffalo Products	Printer Sharing Solutions	332	729	Corel Systems	Corel Draw	194
745	Digital Products	Print Director	174	*	Lotus Development Corp	Freelance Graphics for Windows	203-210
262	Hewlett Packard Peripheral Group	DeskJet C	148-149	*	Microtrak	Designer	171
195	Lasermaster	Win Printer	165	VIDEO GRAPHICS BOARDS			
245	Output Technology	EuroLine	175	337	ATI Technologies Inc.	8514 - ULTRA	92
HIGH RESOLUTION PRINTER BOARDS				*	Swan Technologies	VGA Boards	325-328
195	Lasermaster	Win Printer	165	342	Truevision Inc	Video Graphics Boards	151
MULTI-MEDIA				ACCELERATOR BOARDS			
540	ATI Technologies Inc	Stereo - F/X	193	127	JDR Microdevices	Add-Ins	422
269	Radio Shack	MultiMedia, Computers	72	COMMUNICATIONS SOFTWARE			
PORTABLE/LAP COMPUTERS				339	Microcom	Carbon Copy for Windows	43
734	AT&T Safan Systems	Safan Notebook	213	290	Rose Electronics	Communications Software	73
*	CompuAdd	Laptops	301-308	367	Universal Data Systems	Communications Software	406
109	Computer Discount Warehouse	Monitors/Laptops/Modems	424-425	LOCAL AREA NETWORKING			
536	Dell Computer Corporation	Laptops	C5-C8	293	3 Com	LAN	166-167
532	Dell Computer Corporation	Laptops	142-143	254	Artisoft	LANTASTIC	362
470	Dell Computer Corporation	Laptops	144-145	319	Cardinal Technologies	Fax/Modem	234
480	Dell Computer Corporation	Laptops	216-217	745	Digital Products	Print Director	174
*	Dell Computer Corporation	Laptops	477-478	146	Gateway Communications	Ethernet Board	351
284	EPS Technologies	Compatibles, Mail Order	99-101	388	Hayes Microcomputer Products	LANstep	360
479	Ergo Computing Inc.	Portables	223	309	LANtek Computer, Inc.	LAN	421
294	ET	ValueLine Laptops	414	144	On-Line Computer Systems	OPTI-NET	359
*	Everex	Tempo Family	228-229	290	Rose Electronics	Peripheral Sharing Switches	73
*	Everex	Tempo Family	295-297	MODEMS			
200	Great Europe-Asia Corp	GEA N8900 Notebook Computer	393	319	Cardinal Technologies	Fax/Modem	234
*	Insight Computers	Notebooks	124-125	109	Computer Discount Warehouse	Monitors/Laptops/Modems	424-425
483	Momenta Corporation	Pen Based	106-109	740	Sierra Semiconductor	Fax/Modem	214
156	NEC Technologies, Inc.	UltraLite III	40-41	367	Universal Data Systems	Modems	406
157	NEC Technologies, Inc.	Prospeed 486SX/C	84	EMULATORS/PROTOCOL CONVERTERS			
*	Northgate Computer Systems	Compatibles, Mail Order	277	*	Pacific Data Products	Pacific Page XL	45
327	Northgate Computer Systems	Compatibles, Mail Order	278-279	MULTIUSER SYSTEMS			
207	Northgate Computer Systems	Compatibles, Mail Order	280-281	290	Rose Electronics	Master Switch	73
243	Northgate Computer Systems	Compatibles, Mail Order	282-283	SOFTWARE MEDIA SHARING			
368	Northgate Computer Systems	Compatibles, Mail Order	284	*	Lotus Development Corp.	Lotus Notes	203-210
*	PC Zones	Laptops	344-347	PERIPHERAL SHARING DEVICE			
*	Quill Corp	Laptops	219	111	ASP Computer Products	Jetway/Laser Share	86
289	Radio Shack	MultiMedia, Computers	72	328	Buffalo Products	Printer Sharing Solutions	332
304	Texas Instruments	Notebooks	325-328	745	Digital Products	Print Director	174
168	Toshiba of America	Travelmate	225	228	Invisible Software	LAN	341
379	Toshiba of America	Notebook	152-153	290	Rose Electronics	Master Switch	73
*	Zaos International	Zaos Notebook	243-250	REMOTE COMPUTING			
PC-FAX				339	Microcom	Carbon Copy for Windows	43
319	Cardinal Technologies	Fax/Modem	234	DATA CARTRIDGES/FLOPPY DISKS			
740	Sierra Semiconductor	Fax/Modem	214	*	Maxell	Floppy Disks	154
367	Universal Data Systems	Fax	406	PC ACCESSORIES			
CO-PROCESSORS				731	Stac	Electronics Stacker	82-83
512	Intel Corporation	Math-Co.	188-189	RETAIL/DISTRIBUTORS			
127	JDR Microdevices	Co-Processor	422	289	Radio Shack	MultiMedia, Computers	72
733	ULSI Systems, Inc.	Co-Processor	221	MAIL ORDER			
OPTICAL PERIPHERALS				360	Acma Computers, Inc.	Acma PC's	87
522	Calera Recognition Systems	OCR	311	208	APS Technologies	Mail Order	428
*	PC Zones	Software	344-347	336	Arlington Computer Products	Mail Order	419-420
MEMORY				509	Austin Computers	Mail Order	11-15
382/320	First Source International	Memory	415	481	Bulldog Computer Products	Mail Order Products	427
378	Iomega Corporation	Bernoulli Box	312				
127	JDR Microdevices	Memory	422				
343	Performance Memory Products	Memory	423				
326	Qualitas	Memory Managers	176				

R/S# ADVERTISER PRODUCT PAGE #

190	CallSoft	Mail Order	59
*	CompuAdd	Mail Order	301-308
205	Compuclassics	Mail Order Products	416
132	COMPU DYNE	Hardware, Software, Peripherals	196-199
300	Computability	Mail Order	417
536	Dell Computer Corporation	Compatibles	C5-C8
532	Dell Computer Corporation	Dell PC's	142-143
470	Dell Computer Corporation	Dell PC's	144-145
480	Dell Computer Corporation	Dell PC's	216-217
*	Dell Computer Corporation	Dell PC's	477-478
347	Dustin Discount Software	Mail Order Products	16
284	EPS Technologies	Mail Order	99-101
479	Ergo Computing Inc.	Mail Order	223
294	ET ValueLine	Mail Order	414
352	FASTMICRO	Mail Order	410-413
382/320	First Source International	Mail Order	415
*	Gateway 2000	Mail Order	113-121
*	Hard Drives International	Mail Order	426
*	Insight Computers	Mail Order	124-125
493	LA Trade	Mail Order	430
309	LANtek Computer, Inc.	Mail Order	421
225	MicroWarehouse Inc.	Mail Order	266-269
489	Midwest Computer Works	Mail Order	420
*	Northgate Computer Systems	Mail Order	277
327	Northgate Computer Systems	Mail Order	278-279
207	Northgate Computer Systems	Mail Order	280-281
243	Northgate Computer Systems	Mail Order	282-283
368	Northgate Computer Systems	Mail Order	284
145	Paradise Computer Products Ltd.	Mail Order	429
*	PC Connection	Mail Order	256-261
*	PC Zones	Mail Order	344-347
343	Performance Memory Products	Mail Order	423
119	Programmer's Paradise	Mail Order	409
*	Quill Corp.	Mail Order	219
349	S&W Electronics	Mail Order	423
373	Software Add-Ons	Mail Order	431
163	Standard Computer	Mail Order	226-227
*	Swan Technologies	PC's, Hardware, Software, Periph	325-328
206	Telemart	Mail Order	67-69
306	Tenex Computer Express	Mail Order Memory Products	430
488	Zeos International	Compatibles	24-25
721	Zeos International	Compatibles	32-33
*	Zeos International	Compatibles	484-1
723	Zeos International	Compatibles	88-89
513	Zeos International	Compatibles	90
*	Zeos International	Compatibles	169
*	Zeos International	Zeos Notebook	243-250
115	Zeos International	Z-Card	251
722	Zeos International	Compatibles	298

ELECTRONIC MAIL

*	Lotus Development Corp.	cc: Mail from Lotus	203-210
---	-------------------------	---------------------	---------

MODELS & SPECS

*	Pen Computer Users Conference	Users Conference	397
---	-------------------------------	------------------	-----

ON-LINE DATABASE

*	PC MagNet	On-line Service	390
---	-----------	-----------------	-----

REPORTS

177	TechBook	Books	320
494	Ziff Davis Press	Books	432
736	Ziff Davis Press	Books	463

DIRECT MARKETING CONNECTION

206	APS Technologies	Mail Order	428
336	Arlington Computer Products	Mail Order	419-420
481	Bulldog Computer Products	Mail Order, Compatibles	427
205	Compuclassics	Mail Order Products	416
300	Computability	Mail Order	417
294	ET	ValueLine Laptops, Compatibles, Mail Order	414
352	FASTMICRO	PC's, Compatibles, Mail Order	410-413
382/320	First Source International	Mail Order, Memory	415
*	Hard Drives International	Mail Order, Mass Storage	426
493	LA Trade	Mail Order	430
309	LANtek Computer, Inc.	Mail Order	421
489	Midwest Computer Works	Mail Order	420
145	Paradise Computer Products Ltd.	Mail Order	429
343	Performance Memory Products	Mail Order, Memory	423
119	Programmer's Paradise	Mail Order	409
349	S&W Electronics	Mail Order	423
373	Software Add-Ons	Mail Order	431
306	Tenex Computer Express	Mail Order Memory Products	430

For Additional Product Categories See
MARKETPLACE PRODUCT INDEX Page 435

■ AMD 40-MHz 386 PCs

How do PCs using Advanced Micro Devices' 40-MHz AM386DXL processor stack up against Intel-based 33-MHz 386 and 20-MHz 486SX systems? With 486SX/20s proving slower in many cases than even 386/33s, it's likely that the AMD systems will run faster still. But Intel has turned its attention to faster versions of the 486 and hopes to leave 386DX buyers on the trailing edge of technology. In this review, PC Magazine Labs tests systems from 15 vendors who have turned to AMD to keep improving on this successful platform.

■ 24-BIT TRUE-COLOR VIDEO BOARDS

If you have anything to do with desktop publishing, 3-D modeling, or computer graphics, and if you demand nothing less than photographic realism from your video monitor, then look no further than PC Magazine's roundup of six 24-bit true-color boards, all capable of delivering 16.8 million colors—at a price.

■ 16-MEGABIT-PER-SECOND EXTERNAL TOKEN-RING LOCAL AREA NETWORK ADAPTERS

External local area network adapters aren't just for laptop computers anymore. The connectivity team tests four 16-megabit external Token-Ring adapters from Accton, IQ Technologies, Megahertz, and Xircom, and finds that innovative I/O approaches may mean the end of the traditional trade of speed for convenience.

■ EDITORS' PERSONAL BEST

Once a year, PC Magazine editors and frequent contributors gather to pick their personal favorites: the best, most useful hardware and software of 1991, chosen from the thousands of products shipped in the past year. Among the two dozen-plus products chosen as Editors' Personal Best this year: an incredible \$1,000 laser printer, Macintosh-caliber illustration software, an electronic Post-It-style utility, project management anyone can use, and a new standard for personal financial management.

■ ABORT, RETRY, FAIL? SPECIAL EDITION

What are the three biggest lies in the computer industry? Who has the slowest Windows programs (and what's wrong with Windows, anyway)? What was the dumbest mistake PC Magazine ever made? Executive editor Bill Howard recounts the year's most memorable moments and salutes the first decade of the PC industry. Read this special edition of Abort, Retry, Fail? for contributing editor Jim Seymour's annual thumbs up/thumbs down salute and the ten dumbest products in PC history (yes, the PCjr made the list).

■ PC MAGAZINE INDEX

Readers asked for it. We listened. Now you've got it: An index to the past year of PC Magazine: PC Labs comparative reviews, editors' columns, Lab Notes, Utilities, Environments, and Power Programming. Keep this as a handy reference when you need to find a review or other article from one of PC Magazine's 1991 issues.

READER SERVICE NUMBER	PRODUCT	COMPANY	PAGE	READER SERVICE NUMBER	PRODUCT	COMPANY	PAGE	READER SERVICE NUMBER	PRODUCT	COMPANY	PAGE
AFTER HOURS											
550	Kid Pix	Broderbund Software	471	436	Surround Sound Module	ATI Technologies Inc.	61	442	One-Write Plus Accounting Works	Great American Software	64
602	Eco-Saurus	First Byte	471	438	Borland C++ with Application Framework	Borland International Inc.	62	408	Wingz, Version 1.1a	Informix Software Inc.	309
549	Reader Rabbit 2	The Learning Company	471	447	Space Maker	ECCS Inc.	66	401	Lotus 1-2-3 for DOS, Release 2.3	Lotus Development Corp.	265
601	Kidz Mouse	Logitech	471	705	InfraLink	InfraLink	50	402	Lotus 1-2-3 for DOS, Release 3.1	Lotus Development Corp.	273
603	The Sierra Network	The Sierra Network	471	444	T560i	Nanao USA Corp.	66	403	Lotus 1-2-3 for Windows, Version 1.0	Lotus Development Corp.	273
COMPUTERS				431	MonaLisa Display Board	OPTA	42	706	Action!	Macro Mini	35
409	AcerPower 486SX	Acer America Corp.	167	702	QBlazer	Telebit Corp.	50	700	Windows Draw, Version 3.0	Micrografx	38
410	ACMA 486SX/20	ACMA Computers Inc.	170	PRINTERS				704	Word for Windows, Version 2.0	Microsoft Corp.	35
411	ALR BusinessStation 486ASX	Advanced Logic Research Inc.	177	439	JOLT	Dataproducts Corp.	62	405	Microsoft Excel, Version 3.0	Microsoft Corp.	292
412	Mitac 4270E	American Mitac Corp.	184	443	Everex LaserScript FAX	Everex Systems Inc.	64	445	MenuWorks Total Security	PC Dynamics Inc.	66
413	Ares 486-20SX Sonic	Ares Microdevelopment Inc.	190	READ ONLY				448	PackRat, Version 4.0	Polaris Software	48
414	AST Premium II 486SX/20	AST Research Inc.	192	397	The New Hacker's Dictionary	The MIT Press	71	440	Way You Work	Protco Technology Corp.	64
415	Austin 486/SX20 Winstation	Austin Computer Systems	195	397	Technobabble	The MIT Press	71	437	Norton Backup, Version 2.0	Symantec Corp.	62
416	Blackship 486SX/20U	Blackship Computer Systems Inc.	201	396	PC Magazine DOS 5 Techniques and Utilities	Ziff-Davis Press	71	430	Adept, Version 2.0	Symbologic Corp.	58
417	C ² Micro 486SX	C ² MicroSystems Inc.	202	SOFTWARE				701	Actor, Version 1.0	The White Water Group Inc.	46
446	386s/20n Model 60	Compaq Computer Corp.	66	441	PhotoStyler 1.1	Aldus Corp.	64	703	LapLink Pro	Travelling Software Inc.	44
418	Dell PowerLine 420DE	Dell Computer Corp.	211	407	Quattro Pro, Version 3.01	Borland International Inc.	300	406	PlanPerfect, Version 5.1	WordPerfect Corp.	294
419	Moby Brick 486SX-20	Ergo Computing Inc.	212	432	PowerMenu Plus, Version 6.0	Brown Bag Software	56	435	WordPerfect for Windows	WordPerfect Corp.	61
420	Everex Tempo 486SX/20	Everex Systems Inc.	215	433	TakeNote	ButtonWare Inc.	56	TOOLKITS			
421	Hyundai Corporate Series 486SX/20	Hyundai Electronics America	218	399	CA-SuperCalc, Version 5.1	Computer Associates International Inc.	255	695	Custom Control Factory (CCF)	Desaware	75
422	IBM PS/2 Model 90 XP	IBM Corp.	220	404	Lucid 3-D, Version 2.2	DacEasy Inc.	285	696	VB Tools	Microhelp Inc.	75
423	PC Partner VX	Leading Technology Inc.	222	400	InstaCalc, Version 3.0	FormalSoft	262				
434	Ultralite III	NEC Technologies	50	PRODUCTIVITY							
424	Novas 486SX-20	Novacor Inc.	226	DEPARTMENT	PROGRAM NAME / DESCRIPTION						
425	Standard 486SX/20 Windows Workstation	Standard Computer Corp.	231	Utilities	WINNAV.EXE Manages Your Files Under Windows.						365
426	Swan 486SX	Swan Technologies	234	Environments	Exploring Waveform Audio: Building a Digital Tape Recorder.						371
427	Zeos 486SX-20C Ltd.	Zeos International Ltd.	236	Power Programming	Optimizing Assembly Language Programs, Part 3.						377
CONNECTIVITY				Windows	The real purpose of .TMP files.						381
604	CD Server/386	CBIS Inc.	348	Windows	Overcoming the Program Manager's command line limit.						381
604	CD Connection, Version 2.20C	CBIS Inc.	348	Windows	Creating a larger Program Manager font.						381
605	CorelDriver Optical Disk Interface Kit	Corel Systems Corp.	355	Databases	Two ways to get the current drive letter in your applications.						385
606	CD Net Integrated System Model 314	Meridian Data Inc.	356	Spreadsheets	Print spreadsheets with margins wider than 240 characters.						387
606	CD Net, Version 4.11	Meridian Data Inc.	356	Spreadsheets	A macro that creates a histogram for any column of data.						387
607	SCSI Express, Version 1.07 level A	Micro Design International Inc.	359	The Working Word	Achieve true WYSIWYG by matching screen fonts and printer fonts.						391
608	Opti-Net, DOS Version 1.3	Online Computer Systems Inc.	361	User-to-User	Create a special floppy disk to speed your system's boot-up.						395
HARDWARE				User-to-User	Add comments to batch files without slowing them down.						395
450	Central Station	Artisoft Inc.	49	User-to-User	An easy way to review the files you've worked on since your last backup.						395
				Languages	Discover the power of Turbo Pascal's typed constants.						399
				Languages	A QuickBASIC function lets you perform exact currency calculations.						399
				Tutor	When and why you might need to use SHARE under DOS 5.0.						403
				Tutor	How to replace internal DOS commands with your own utilities.						403
				Connectivity	Using a tape backup system on a network.						407
				Connectivity	Printing to a networked printer from a single-user program.						407
				Connectivity	A hardware solution that speeds the printing of large graphics files.						407
				Connectivity	Maintaining file-level security.						407
				Connectivity	Using flow control with modems and communications software.						407

Announcing

Select Demos™

The Easy, Hands-On Way To Identify, Evaluate And Compare Software Products

BONUS Includes
a complete copy of
**GeoWorks
Ensemble™**
1.0

LIMITED-TIME
OFFER
Just \$99
LIST PRICE \$149
ORDER NOW AND SAVE
\$50.00

Now you can identify, evaluate and compare over 1,000 software programs, quickly and easily. Just use SELECT DEMOS. It features over 1,000 MS-DOS® and Windows® based software demonstrations and working models, plus 7 complete programs.

SELECT DEMOS lets you "shop-at-your-computer" for the best software available. You get complete product demonstrations. Full technical specifications. And hands-on experience to help you make the smartest buying decision possible.

With SELECT DEMOS you'll know before you buy. You'll know if the program really meets your needs. If it's within your budget. If the interface is easy to work with.

SELECT DEMOS eliminates the risk of missing important software products because you'll get a full range of available software programs for different applications.

And SELECT DEMOS saves you hours, even days. SELECT DEMOS does all the legwork for you. You are presented with the most complete, most current demos, all on one convenient disc.

SELECT DEMOS Lets You Put Software To the Test And Show Your Results To Others

SELECT DEMOS' powerful search software helps you identify the programs that might meet your needs. Then copy the demos to floppy disks to compare and evaluate.

Once you've decided on the programs you like best, you can show them to management, or to the people who will use the programs. It's a great way to support your purchasing decisions.

Save \$50.00 If You Act Now

Order now and save \$50.00 off the regular price. Just \$99 for over 1,000 software demonstrations on Select Demos. But only if you call or write now. Hurry!

New From The Publishers Of *PC Magazine*, *PC/Computing* and *PC Week*...SELECT DEMOS Gives You Demos Of Over 1,000 Top Software Products On One CD-ROM—Plus 7 Complete Programs Included **FREE!**

SPECIAL BONUS

VALUABLE SOFTWARE PRODUCTS **FREE**

In addition to over 1,000 demos, you'll also receive complete versions of these products—as a special free bonus!

GEOWORKS ENSEMBLE™

Winner of four Software Publishers Association 1990 Excellence Awards, including Best Personal Productivity and Best Consumer programs; 1990 Most Valuable Product by PC/Computing; and 1990 Product of the Year by InfoWorld, this high performance, multitasking graphical environment comes complete with seven state-of-the-art applications: word processing/desktop publishing, file management, communications, drawing, scheduling, personal information management and Solitaire. Advanced imaging and printing technology permits multicolumn formatting, 24-bit color and font scaling with true WYSIWYG output on a wide variety of dot matrix, ink jet or laser printers. Ensemble multitasks on any PC, from an XT to a 386, laptop or desktop computer. MSDOS 5.0 compatible. List Price \$199.95.

CheckFree®—An electronic bill-payment program that allows you to simply and safely pay bills without using a pen, checkbook, envelopes or stamps. Transactions are automatically recorded and documented on your bank statement. Permits tracking of bills by multiple budget categories and split transactions. List Price: \$29.95

Smartcom EZ—A complete communications program from Hayes Microcomputer Products featuring storage of parameters for multiple services, Xmodem file transfers. TTY/VT102 emulation and keyboard macros. List Price \$49.

Plus four leading 1990 personal tax programs—**Andrew Tobias' TaxCut™** (MECA Software), **MacinTax® For Windows** (Softview), **TurboTax® Personal** (ChipSoft), and **1040™** (G&G Software). Combined List Price: \$579.

Total price if purchased separately: \$857.90. But it's all yours free from Select Demos!



Over 1,000 software product demonstrations at your fingertips. Easy-to-do searches locate the programs you want to try by name, vendor, type of product, price or other descriptive information.

The world's leading software publishers have included demos of their products in SELECT DEMOS. You'll be able to try over 1,000 software demos, all the applications you want most, from over 600 leading software publishers. Here are just a few samples...

Word Processing: Ami Pro™; Microsoft® Word; Professional Write® Plus; WordPerfect®; JustWrite™.

Spreadsheet: CA Compete!™; Microsoft® Excel; Lotus® 1-2-3® Release 3.1; Quattro® Pro; SuperCalc 5®; Lotus® Symphony®.

Presentation Graphics: Applause II™; Lotus® Freelance® PLUS; Hollywood™; Presentation Team™; Microsoft® PowerPoint; Storyboard™ Live!; Aldus Persuasion®.

Desktop Publishing: The New Print Shop®; Aldus PageMaker®; Ventura Publisher®.

Personal Information Management: Lotus® Agenda®; Current; SIDEKICK®.

Database: dBASE IV®; DataEase®; DataPerfect®; FoxPro™; PARADOX®.

GUI Environment: GeoWorks Ensemble™; TOOLBOOK®; Microsoft® Windows™ 3.0.

Drawing: Artline®; CORELDRAW!; GEM® Draw Plus™; PC Paintbrush IV Plus™.

Network: LANtastic; Saber Menu System; VINES®/386.

Communications: CO/Session; DynaComm®; Smartcom Exec™; BeyondMail™; cc-Mail.

CAD: AUTOSKETCH®; Generic CADD.

Accounting: ACCPAC®; DacEasy™...and much, much more!

ORDER NOW AND SAVE \$50.00 ON SELECT DEMOS AND GET 7 COMPLETE PROGRAMS—FREE.

1-800-848-1472 EXT. 102

OUTSIDE U.S. CALL (212) 503-4400

LIBRARY

1 Park Avenue, New York, NY 10016

© 1991 Ziff Communications Company. All rights reserved. Computer Library and Select Demos are trademarks of Ziff Communications Company. Other trademarks mentioned are trademarks of their respective companies.

CIRCLE 183 ON READER SERVICE CARD

After Hours

Products for the Leisure Side of Personal Computing

Reader Rabbit Redux

EDUCATION
by Robin Ras

Reader Rabbit is an old friend. First installed on my PC back in 1985 to help my children learn their consonant and vowel sounds, the aging rabbit was finally retired a few years ago. He no longer cut it in a world where color graphics, sound, and animation had become important parts of computing fun.

With *Reader Rabbit 2*, the rabbit is back with complete support for 256-color VGA graphics, a mouse-driven environment (keyboard input is still accepted),

entertaining sound, and slick animation sequences. The exercises are different from the original *Reader Rabbit* (see the sidebar "Reader Rabbit Grows Up"), but they are just as much fun and just as important for beginning readers (ages 5 to 8).

Rabbit 2 lives in a charming little place called Wordsville, where kids can hone pre-reading skills. Four games are available; each is set in a different Wordsville locale.

Kids learn about compound word construction at the Word Mine. In this crystal mine, the miner's cart has a picture of an

object with half of the word (for example, "butter"). Your job is to find the crystal with the other half of the compound word ("fly," to spell *butterfly*). Here, as in the other games, play becomes more challenging. At the highest level, you must type the second part of the compound word without any on-screen prompts. Unfortunately, my kids soon discovered that you can type the same word over and over and win crystals fast.

At the Vowel Pond, kids go fishing for short and long vowel sounds. They must decide if the fish, sporting words on their bellies, match the phonics displayed on their fish bucket, and then opt whether to catch a fish

■ **EDUCATION**
Kid Pix brings kid's creativity to the PC.

■ **CHILDREN**
Logitech's better mouse for little hands.

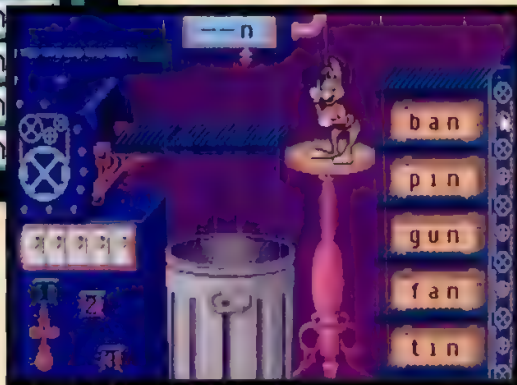
■ **EDUCATION**
Eco-Saurus makes recycling fun.

■ **ENTERTAINMENT**
Dial-a-game with *The Sierra Network*.

Reader Rabbit Grows Up



Reader Rabbit now supports 256-color VGA, a major improvement from the original CGA and previous 16-color EGA versions. The Sorter game is shown here.



The original *Reader Rabbit* just got a face-lift. The play is the same, but the graphics and sound have been revamped to keep pace with the arrival of *Reader Rabbit 2*. *Reader Rabbit 1* also has four games:

■ **Sorter:** You must match words with the same letter as is shown on the sorter machine. If the word doesn't match, toss it in a trash can.

■ **Labeler:** Pictures of objects have scrambled words beneath them. Using the mouse or keyboard, you unscramble the words.

■ **Word Train:** Build a train where each car contains a word that differs from the car before it by only one letter. If you get it right, the train leaves the station in song.

■ **Matchup Games:** A variation on the memory game that lets you match pictures, words, and letters on a game board.

or to let it go. To play, you must know the symbols for long and short vowels.

The Match Patch is a variation on the old memory game. In this game you can match rhymes, opposites, and homonyms; the words appear on carrots, buried in the ground. Younger children would benefit more from matching a word with a picture of the word.

Finally, the Alphabet Dance teaches alphabetical order. It also has the highest frustration level of the exercises. In a colorful barn scene, four dancing characters must be lined up in alphabetical order by name. You need to realign them, but moving the dancers involves clicking, moving the mouse, and then clicking again. This complexity is likely to confuse younger children about which characters they are moving. At its hardest level, you must alphabetize the first two letters of the word.

All of *Rabbit 2*'s games are rewarded with whimsical animation sequences. They also share multilevels of play and are

CONTINUES

After Hours

Reader Rabbit Redux

CONTINUED
educationally sound. However, the words in the game are displayed on-screen in lowercase, while the keyboard remains an uppercase device. Wouldn't it be nice if pre-readers could learn the same symbols on the keyboard as on the screen? Also,

Rabbit 2 doesn't provide enough motivation to progress to the next level. Most kids quit playing long before they advance, and since the game does not save your place, all progress is lost when you resume playing.

Criticisms aside, *Reader Rabbit* has helped teach all my children to read, but only the youngest will benefit from the color, graphics, and sound of *Rabbit 2*. **List Price:** *Reader Rabbit 2*, \$59.95. **Requires:** 512K RAM, graphics monitor, DOS 2.0 or



In the Wordsville carrot patch, your children have to help *Reader Rabbit 2* match the words that rhyme.

later. Mouse and sound card are recommended. The Learning Company, 6493

Kaiser Dr., Fremont, CA 94555; 800-852-2255, 510-792-2101.

CIRCLE 549 ON READER SERVICE CARD

Fun with Goofy Paint Tools

EDUCATION
by Robin Raskin

Usually, when I hear my children describe something as "awesome," I begin to feel nauseous. But when they use the word to describe *Kid Pix*, Broderbund's classic kid's paint program for the Macintosh that is now debuting on the PC, I nod in agreement. The \$59.95 *Kid Pix* fuses the high-tech tools you'd expect to find in the best paint programs with whimsical, play-

ing its hidden possibilities.

For example, you can erase your picture with one of 14 different erasers. One is a firecracker that "blows up" on your screen. Others include sliding doors, fade outs, sweeps, countdowns, and a black hole that gobbles up your screen. Since erasing is so much fun, your kids will never feel too bad about making a mistake.

Even the most inhibited artist can get started with the Stamp tool. It lets you select and place dozens of icons on-screen. Then there are the special picture effects. Invert the picture, splatter it with blobs of paint, slice it into stripes, outline it, shrink portions of it, shatter or overlap it. These are modern tools for modern artists.

To add to the fun, all the tools have sound effects. Paint pours out on the electronic canvas with a gurgle, and you move objects around on-screen to the sound of a truck. Anything you

do (except erase) can be undone by clicking on the Undo man—who shakes his head and says "Oops!" each time you use him.

Unfortunately, *Kid Pix* is not a great talker unless you have Sound Blaster, Disney Sound Source, PS/1 Sound Option, or Tandy Digital Sound. But if you do, you can add sound bytes (included on-disk) to drawings.

Kid Pix is not a Windows program, but it makes full use of its own GUI environment. A few simple pull-down menus across the top of the screen let you open and save files, as well as cut and

paste portions of your picture. For the smallest artists there's a "safe" Small Kids mode where the main menu bar is hidden to prevent tiny ones from accidentally saving or deleting files. I found that most youngsters were too intrigued with the tools to care about the "words" on the menu, and I found it a nuisance to reactivate the menus after making the program safe. One positive aspect of the interface is that users can switch the menus from English to Spanish.

The most challenging thing about *Kid Pix* is discovering everything inside of it. It took us the better part of a week before we discovered that clicking on the "?" eraser gave us a blank screen containing hidden pictures to be rubbed to the surface.

You won't have to crack the manual or on-line help to learn 99 percent of this program, but a

few tricks (such as sizing stamps) you'll learn only by reading, due in part to the poor quality of *Kid Pix*'s on-line help. Printing to an HP LaserJet was also disappointing, as many of the colors on-screen were not mapped properly. Users with color printers will be happier.

Still, this is a four-star program. Like Lego and Lincoln Logs, *Kid Pix* is completely open-ended. It's an essential tool for the parenting trade. You'll end up fighting your kids to play with this one.

List Price: *Kid Pix*, \$59.95.

Requires: 640K RAM, hard disk, DOS 2.11 or later, graphics adapter, mouse; sound card and printer recommended. Broderbund Software, Inc., 500 Redwood Blvd., P.O. Box 6121, Novato, CA 94948; 800-521-6263, 415-382-4400.

CIRCLE 550 ON READER SERVICE CARD



With a fractal tree, Wacky Brush, and a Stamp tool, *Kid Pix* is unlike any drawing tool you've seen before.

ful touches. The result is a paint program unlike any other.

All the traditional goodies are here: brushes, paints, erasers, clip art, text, and more. But you probably won't want to use them much after a dabble with the Wacky Brush collection. One brush simulates a leaky pen. Others draw concentric circles, fractal trees, fuzzy pictures, splatterpaints, zigzags, swirls, and streams of alphabetical characters. The result is a program that turns kids and adults alike into intrepid explorers of electronic art. Half the fun of this program is discover-

Logitech Gives Little Ones A Mouse of Their Own

CHILDREN
by Carol Ellison

With its debut of Kidz Mouse, an easy-to-use, easy-to-install, and exceptionally cute rendition of our favorite pointing device, Logitech joins the growing number of companies targeting products at the home market. But, as its name suggests, Kidz Mouse isn't exactly aimed at the home. Kidz is for kids.

Kidz Mouse combines the charm of a toy with the functionality of the real thing. Finally, a mouse that looks like a mouse! The cord trails behind like a long blue tail, and its ears, which serve double-duty as left and right mouse

buttons, are made of matching blue plastic. Two little plastic bumps on the "body" stand out like eyes above a pointy nose.

Like an adult mouse, Kidz Mouse can be configured for two-button use, and it's fully compatible with its big brother, Logitech's MouseMan. And because it uses the same driver, you won't have to reconfigure programs if you and your kids have used MouseMan until now.

Also like MouseMan, Kidz Mouse is ergonomically designed. But we're talking microergonomics here, the kind suited for tiny fingers. Kidz Mouse's ears are too close for adults to use

CONTINUES

After Hours

Kidz Mouse

CONTINUED

comfortably. Logitech's documentation clearly spells out how Kidz Mouse can be interchanged with an adult mouse, as well as how to leave both hooked up to your PC. Logitech even sells an extension cable, so your kids won't attempt to unplug your mouse and try to plug in theirs.

The menu-driven installation program automatically detects whether you currently have a mouse installed. If you do, it prompts you to install the software for "dual mode" operation, allowing both to run on the same computer. The software also includes a brief but outstanding tutorial that helps kids practice using a mouse and defines mouse words such as pointing, clicking, and dragging.

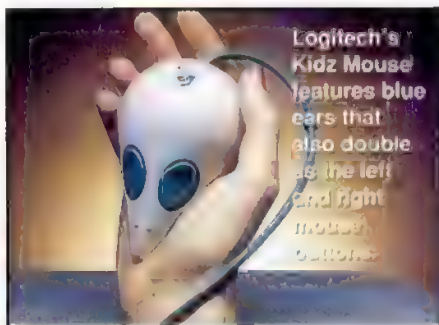
A bonus bundled with the mouse is First Byte's *Dinosaur Discovery Kit*, a creative program for preschoolers. It has an on-screen "coloring

book," a match game, and a simple "story maker," which is actually the simplest sort of desktop publishing program, and lets kids combine dinosaur illustrations with a story line and print out the result.

If you think the Kidz Mouse sounds cool, you'll want to ask yourself a few questions before buying: Can I live with cramped fingers if Kidz Mouse is our only mouse? Or, if it's the second, do I really want to play mouse-swap or have an extra mouse scrambling across the desk? Kidz Mouse could be a lovable expansion option, as long as you don't mind having a family of rodents on your desktop.

List Price: Kidz Mouse, \$79. Logitech, 6505 Kaiser Dr., Fremont, CA 94555; 415-795-8100.

CIRCLE 601 ON READER SERVICE CARD



Eco-Saurus: PC Adventure Teaches Children Recycling And Conservation

EDUCATION
by Charles Tent

Zug the Megasaurus can't do it alone. His buddy M-Kar's spaceship has crashed on Eco Island, and Zug is trying to rebuild it so M-Kar can go home. They need your help. Become an Environmental Conservation Officer (an Eco-saurus), collect all the recyclable materials on Eco Island, bring them to the Recyclatorium, and watch Zug recycle them into usable parts for M-Kar's spaceship. You'll discover that Eco Island used to be lush and beautiful, but now it's an environmental disaster. It's up to you to make it beautiful again.

Eco-Saurus, the latest in First Byte's series of Zug programs,

is well designed. As an Eco-saurus, you travel throughout Eco Island gathering all recyclables (e.g., discarded soda cans, coffee cups, newspapers, glass bottles, and organic waste).

You'll meet various islanders, including Vinnie the Volcano (who owns the geothermal power plant) and Tyrone A. Saurus (the famous actor). These folks help you gather the recyclable garbage and give you information on recycling. Tyrone, for example, collects paper from old scripts and popcorn containers. Players learn that recycling isn't easy; you may have to visit some folks more than once (especially the infamous Mr. Bronto) to collect all recyclable materials and conserve all wasted resources.

The Sierra Network: On-Line Game World Where It's Never Too Late to Play

ENTERTAINMENT
by Don Trivette

It's three o'clock in the morning. You just got off a swing shift and aren't ready for sleep. Now there's a new place in town where you can hang out and have some fun. *The Sierra Network* is the newest entertainment offering from the folks who brought us *King's Quest* and *Leisure Suit Larry*.

Unlike other on-line networks that try to be both entertaining and educational, *TSN* is pure entertainment and proud of it. No databases, stock quotes, or seminars here. Basic service includes six multiplayer board games: checkers, backgammon, cribbage, chess, bridge, and hearts. The first four are for two players, hearts is played with either three or four *TSN*ers, and contract bridge requires four players. All games are conducted with real life, warm-bodied humans—no computer opponents are allowed.

TSN logs you into a "waiting

room" that displays the names of everyone active. If there's an icon beside a name, it means the person is already playing a game. A chess piece, for example, signifies a chess game. Issuing an invitation is as easy as clicking the names of people you want to invite and picking a game icon. Your invitation appears on their screens; they may accept or decline.

As part of the setup you create a graphical representation of yourself by selecting from built-in features and clothing. There are dozens of hair styles, eyes, noses, and mouths for each gender. The idea is to come up with an approximation of your appearance and style. To further identify yourself, you can supply your age, hobbies, hometown, and skill/interest level in each game. When someone "looks" at you, this is the information he or she receives.

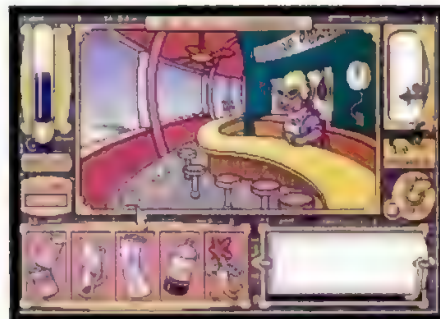
Clicking on a name and typ-

CONTINUES

Eco-Saurus's graphics will capture young children's imaginations. The recycling information is useful, and the program's speech capability provides reinforcement for pre-reading Eco-sauri. (It's recommended for ages 4 to 9.) The reference manual gives clear directions, and the map helps players navigate the island. The manual's Facts and Trivia Quizzes keep players interested well beyond the first play.

First-time players may need a few minutes to learn the program. For example, we don't use styrofoam coffee cups in our house, so our 6-year-old son Benjamin initially tried to place the discarded coffee cups he found on Eco Island in the "paper" bin instead of the "plastic" bin.

Perhaps the best part of *Eco-Saurus* is that it really teaches



Eco-Saurus teaches kids to recycle waste products, like the glass jar found here in Stacy's Steak-A-Saurus diner.

children to conserve our natural resources and recycle. It's an excellent way to start family discussions on ecology, and Ben is now taking an active interest in recycling his soda cans.

List Price: *Eco-Saurus*, \$39.95. **Requires:** 640K RAM, hard disk, EGA or VGA graphics, DOS 3.0 or later. First Byte, P.O. Box 2961, Torrance, CA 90509; 800-545-7677, 213-534-4070.

CIRCLE 602 ON READER SERVICE CARD

After Hours

The Sierra Network

CONTINUED

ing a message is the way TSNers chat. There are some interesting people out there, and the rumor is that some serious relationships have already developed. Since most of the original group were from two areas of California, they get together for camping and amusement park junkets to see how closely the participants resemble their TSN characters.

This is the first network software designed for people, not computers. There are no commands to type and nothing to remember—everything except “talking” is accomplished by clicking icons. But it’s no accident that TSN is so super friendly: The developers tested it for months on groups of people who had never been near a computer,

including senior citizens.

TSN’s software is free, but the access charges vary depending on your location and the time of day. Eventually Sierra wants to make TSN available across the country for a low, flat-rate charge, but until the number of users builds up, only those in dedicated areas of California can access TSN for \$11.95 per month. In other areas you’ll have to reach TSN through the Sprint/Telenet network at \$2 per hour 6 P.M. through 6 A.M. (user’s time) and \$7 per hour during prime hours; there’s also a \$4.95 monthly charge.

Ken Williams, the president of Sierra, sees TSN as an entertainment product similar to cable television, and he is planning some “premium channels” beyond the basic service. Due next year is *SierraLand*, which (for now) promises features like miniature golf, bumper boats, and a video arcade. *LarryLand*, also in the future, will be a multiplayer *Leisure-Suit Larry*

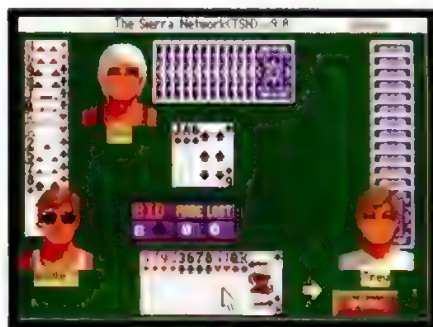
game with a casino, comedy club, and, of course, Lefty’s Bar.

TSN does for computer networks what *King’s Quest* did for adventure games: It defines a whole new standard for the class. But some things could be done better. There are no private mailboxes, so information you leave for your friends is read, and often commented upon, by others. The VGA graphics are good but do not compare favorably, for example, with those in the card games under *Windows*. And there is no block-out feature to quash messages from obnoxious users. Many of these things will be added as the network matures. For now, TSN is the best place to go for a late game

of bridge or to make new friends. It never closes.

List Price: *The Sierra Network*, free. **Requires:** 8088 running at 8 MHz, 640K RAM, EGA or VGA monitor, modem, DOS 3.1 or later; 286-based PC, mouse recommended. The Sierra Network, P.O. Box 485, Coarsegold, CA 93614; 800-743-7721.

CIRCLE 603 ON READER SERVICE CARD



With *The Sierra Network*, you see a graphical representation of your opponents while you play.

Hate to...
...file medical claims?
...choose among
policy options?

NEW MedSure™
Your Health Insurance Manager™

- ☐ Makes filing and tracking claims a snap!
- ☐ Compares policies and options
- ☐ Prints claim form accepted by nearly all major insurers
- ☐ Tracks Medicare and files Medigap claims
- ☐ And much, much more!

Specifications: 100% IBM compatibles, 512K RAM and DOS 2.11 or higher.



Andrew Tobias, author of *Managing Your Money*, writes: "MedSure is groundbreaking software, the product of a great deal of research and hard work. If you're serious about managing your health insurance policies and tracking your claims and reimbursements, you should try it. It has some remarkable features you wouldn't expect, and it comes with a money-back guarantee."

© Time Solutions, Inc.

☐ **Yes, send me MedSure for just \$89.95.**

NAME _____
ADDRESS _____
CITY/STATE/ZIP _____
DAYTIME PHONE _____

MedSure

P.O. Box 1587 SMS, Fairfield, CT 06430

☐ Visa ☐ Mastercard ☐ Check encl.

CARD NO _____

EXP. DATE _____

SIGNATURE _____

100% Money-Back Guarantee

If you aren't convinced that MedSure saves you more money on health insurance and/or taxes than you pay for MedSure, we will refund all of your \$89.95 payment when you return the product.

Free shipping within U.S. CT residents add sales tax.
Coupon orders allow three weeks for delivery.

1-800-552-3302

CIRCLE 335 ON READER SERVICE CARD

What Kills More
Americans Each Year
Than Cocaine,
Heroin, Suicide,
Alcohol Abuse,
Auto Accidents
And Homicide
Combined?
Lung Disease.
Including Lung Cancer.

It's a matter of life and breath.®

AMERICAN  LUNG ASSOCIATION®
The Christmas Seal People®

Space contributed by the publisher as a public service.



**Statement of Ownership,
Management and
Circulation**
(Required by 39 U.S.C. 3685)

1A. Title of Publication PC Magazine		1B. PUBLICATION NO. <table border="1"><tr><td>6</td><td>8</td><td>5</td><td>-</td><td>1</td><td>1</td><td>0</td></tr></table>		6	8	5	-	1	1	0	2. Date of Filing 10/1/91
6	8	5	-	1	1	0					
3. Frequency of Issue Biweekly except July and August		3A. No. of Issues Published Annually 22		3B. Annual Subscription Price \$44.97							
4. Complete Mailing Address of Known Office of Publication (Street, City, County, State and ZIP+4 Code) (Not printers) One Park Avenue, New York, NY 10016											
5. Complete Mailing Address of the Headquarters of General Business Offices of the Publisher (Not printer) One Park Avenue, New York, NY 10016											
6. Full Names and Complete Mailing Address of Publisher, Editor, and Managing Editor (This item MUST NOT be blank)											
Publisher (Name and Complete Mailing Address) Ronni Sonnenberg, One Park Avenue, New York, NY 10016											
Editor (Name and Complete Mailing Address) Michael J. Miller, One Park Avenue, New York, NY 10016											
Managing Editor (Name and Complete Mailing Address) Diane D'Angelo, One Park Avenue, New York, NY 10016 Paul B. Ross, One Park Avenue, New York, NY 10016											
7. Owner (If owned by a corporation, its name and address must be stated and also immediately thereunder the names and addresses of stockholders owning or holding 1 percent or more of total amount of stock. If not owned by a corporation, the names and addresses of the individual owners must be given. If owned by a partnership or other unincorporated firm, its name and address, as well as that of each individual must be given. If the publication is published by a nonprofit organization, its name and address must be stated.) (them must be completed.)											
Full Name			Complete Mailing Address								
Ziff Communications Company			One Park Avenue, New York, NY 10016								
Ziff Investment Partnership, L.P.			One Park Avenue, New York, NY 10016								
Philip B. Korsant			One Park Avenue, New York, NY 10016								
8. Known Bondholders, Mortgagees, and Other Security Holders Owning or Holding 1 Percent or More of Total Amount of Bonds, Mortgages or Other Securities (If there are none, so state)											
Full Name			Complete Mailing Address								
None											
9. For Completion by Nonprofit Organizations Authorized To Mail at Special Rates (DMM Section 424.12 only) The purpose, function, and nonprofit status of this organization and the exempt status for Federal income tax purposes (Check one)											
(1) ☐ Has Not Changed During Preceding 12 Months		(2) ☐ Has Changed During Preceding 12 Months		(If changed, publisher must submit explanation of change with this statement.)							
10. Extent and Nature of Circulation (See instructions on reverse side)		Average No. Copies Each Issue During Preceding 12 Months		Actual No. Copies of Single Issue Published Nearest to Filing Date							
A. Total No. Copies (Net Press Run)		999,179		1,041,800							
B. Paid and/or Requested Circulation											
1. Sales through dealers and carriers, street vendors and counter sales		138,570		153,000							
2. Mail Subscription (Paid and/or requested)		682,611		720,500							
C. Total Paid and/or Requested Circulation (Sum of 10B1 and 10B2)		821,181		873,500							
D. Free Distribution by Mail, Carrier or Other Means Samples, Complimentary, and Other Free Copies		21,791		20,000							
E. Total Distribution (Sum of C and D)		842,972		893,500							
F. Copies Not Distributed											
1. Office use, left over, unaccounted, spoiled after printing		12,939		12,600							
2. Return from News Agents		143,268		135,700							
G. TOTAL (Sum of E, F 1 and 2—should equal net press run shown in A)		999,179		1,041,800							
11. I certify that the statements made by me above are correct and complete		Signature and Title of Editor, Publisher, Business Manager, or Owner William L. Phillips, Vice President									

by
Bill Howard

Abort, Retry, Fail?

The Lighter Side of Personal Computing

COMPUTER Animal Farm, Part I:
Ad from Allied
Communications,
Rockville, Maryland.

PACKET
SIGNAL
HYUNDA
MODEL A

Standard Configuration:
40 MegHD 1.2 FD, 1MB RAM
Color VGA, FREE MOOSE

386SX/16 \$875
386/25 \$995
386/33 \$1075



BRIAN SMITH - Miami Herald Staff

'I DON'T NEED PEOPLE': Louis Oaken, 35, spends '20 out of 24 hours a day' on the machines.

LQ-1170
This wide-carriage version of the
LQ-870 has all of the same features
including front, rear, bottom, and
single sheep paper loading
capabilities.

1099

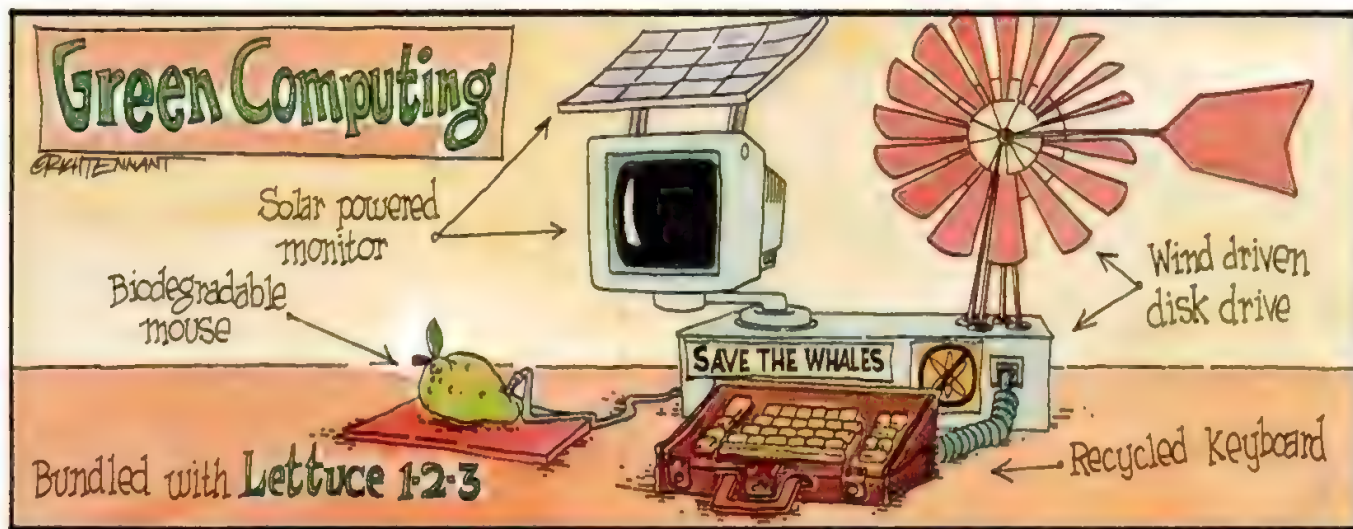
Animal
Farm, Part II:
Epson LQ-1170
ad in the fall 1991
Swan Technologies
mail-order catalog.

FF: 23018 ELQ17 \$649

for ribbons and accessories

This Miami
Herald story on the
tenth anniversary of the
IBM PC shows a user sitting
at a desk—covered with Macs.

Decade of computers: new world for us



CARTOON: RICHARD TENNANT

If your entry is used in Abort, Retry, Fail? we'll send you \$50 and a PC Magazine T-shirt. Caution: In case of multiple entries, the postmark date, neatness, and completeness of entry are considered. Winners this issue: D.F. Neff (dead or alive), Jonathan J. Lytle (free moose), Woodrow W. Harrison (single sheep paper), Bob Weeks (decade of computers).

BUY · SELL · TRADE · REPAIR

**Dead or Alive
Computers/Hard Drives**

1228 W. Lake St.
Roselle, IL 60172

Honesty may not
be the best policy
always:

Ad in The Processor,
September 6, 1991.

THROW THIS IN THE MAIL NOW, SO YOU DON'T THROW YOUR MONEY AWAY LATER.

Send for the brand new Dell product catalog,
loaded with information on all our award-winning
computers, service and support. Plus, get the details

on our newest line of PCs, laptops, note-
books and servers.

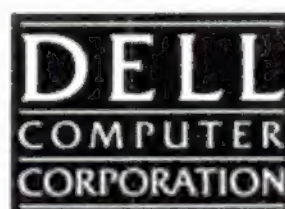
Return this card today, or call us.

TO ORDER, CALL PLEASE REFERENCE 11BP3.

800-873-1130

HOURS: 7AM-9PM CT M-F 8AM-4PM CT SAT

IN CANADA 800-668-3021. IN MEXICO 95-800-010-0664.



Start saving money now, send for your free Dell product catalog,
loaded with information on all our award-winning computers,
service, support and remarkably low prices. Plus, get the details
on our newest line of PCs, laptops, notebooks and servers. Return
this card today, or call us at (800) 873-1130. In Canada, call
(800) 668-3021. In Mexico, call 95-800-010-0664.

☐ Please have a Dell Representative call me.

Name: (M) _____
(Please print)

Title: _____

Company: _____
(If Applicable)

Address: _____

City: _____ State: _____ Zip: _____

Type of Business: _____

Approx. # of Employees in Company: _____

Home Phone: () _____

Business Phone: () _____

Fax #: () _____

1. Which products are you most interested in?

- | | |
|--|--|
| ☐ 286-based systems | ☐ i486-based systems |
| ☐ i386™SX-based systems | ☐ UNIX® based systems |
| ☐ i386-based systems | ☐ Laptops/Notebooks |
| ☐ i486™SX-based systems | ☐ Other: _____ |

2. Are you interested in computer products for:

- ☐ Home ☐ Business ☐ Resale

3. If for resale, please identify your primary customers:

- ☐ General Business ☐ Government ☐ Education ☐ Medical

4. How many PCs does your company plan to purchase in the next
twelve months?

Quantity	Timeframe	Quantity	Timeframe
_____	Less than 1 month	_____	6-12 months
_____	1-3 months	_____	More than 12 months
_____	3-6 months		

5. What do you plan to use computer products for?

6. How many PCs do you have installed now at your company?

7. Are you interested in leasing? ☐ Yes ☐ No

AD CODE 51BP3

Start saving money now, send for your free Dell product catalog,
loaded with information on all our award-winning computers,
service, support and remarkably low prices. Plus, get the details
on our newest line of PCs, laptops, notebooks and servers. Return
this card today, or call us at (800) 873-1130. In Canada, call
(800) 668-3021. In Mexico, call 95-800-010-0664.

☐ Please have a Dell Representative call me.

Name: (M) _____
(Please print)

Title: _____

Company: _____
(If Applicable)

Address: _____

City: _____ State: _____ Zip: _____

Type of Business: _____

Approx. # of Employees in Company: _____

Home Phone: () _____

Business Phone: () _____

Fax #: () _____

1. Which products are you most interested in?

- | | |
|--|--|
| ☐ 286-based systems | ☐ i486-based systems |
| ☐ i386™SX-based systems | ☐ UNIX® based systems |
| ☐ i386-based systems | ☐ Laptops/Notebooks |
| ☐ i486™SX-based systems | ☐ Other: _____ |

2. Are you interested in computer products for:

- ☐ Home ☐ Business ☐ Resale

3. If for resale, please identify your primary customers:

- ☐ General Business ☐ Government ☐ Education ☐ Medical

4. How many PCs does your company plan to purchase in the next
twelve months?

Quantity	Timeframe	Quantity	Timeframe
_____	Less than 1 month	_____	6-12 months
_____	1-3 months	_____	More than 12 months
_____	3-6 months		

5. What do you plan to use computer products for?

6. How many PCs do you have installed now at your company?

7. Are you interested in leasing? ☐ Yes ☐ No

AD CODE 51BP3

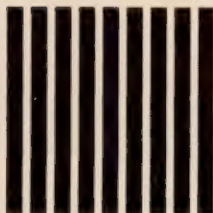
RIP THIS OUT, BEFORE YOU GET RIPPED OFF.

For A Free Catalog Of
Dell's New Computers, Send This Card.

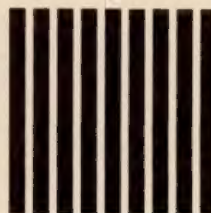


i386 and i486 are trademarks of Intel Corporation. UNIX is a registered trademark of UNIX System Laboratories, Inc. in the U.S. and other countries. ©1991 Dell Computer Corporation. All rights reserved.

NO POSTAGE
NECESSARY
IF MAILED
IN THE
UNITED STATES



NO POSTAGE
NECESSARY
IF MAILED
IN THE
UNITED STATES

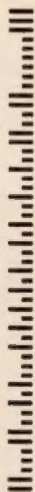


BUSINESS REPLY MAIL

FIRST CLASS MAIL PERMIT NO. 6745 AUSTIN, TEXAS

POSTAGE WILL BE PAID BY ADDRESSEE

DELL COMPUTER CORPORATION
DEPT DH
9505 ARBORETUM BLVD
AUSTIN TX 78759-9860

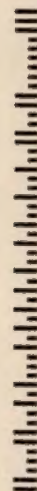


BUSINESS REPLY MAIL

FIRST CLASS MAIL PERMIT NO. 6745 AUSTIN, TEXAS

POSTAGE WILL BE PAID BY ADDRESSEE

DELL COMPUTER CORPORATION
DEPT DH
9505 ARBORETUM BLVD
AUSTIN TX 78759-9860



If you're power hungry, Dell has an i486™ screamer for just \$2,999 that's sure to satisfy. Because not only does this Dell® 433P pack a punch, it's also backed by the company that's known for doing things right. And at Dell, that means doing business directly with you.

Say you want to order a Dell, or ask a few questions. Easy. Just call us and you'll be in touch with the people who not only sell Dell computers, but design and provide award-winning support for them too. Not some detached middle man with middle man hype and a markup to match. But a person who really knows his stuff. In fact, customer feed-back goes right to our R&D department where they use it to develop industry-leading computers. Year after year.

With a gung-ho attitude like that, it's no wonder we became a \$500+ million international company in just 7 years. Or that we'll be around to keep doing business for a long time to come.

So give us a call to order the Dell System® 433P today. We've got everything it takes to give power to the people.

NOW YOU DON'T HAVE TO BE RICH TO BE POWERFUL.



TECH STUFF

• i486DX microprocessor running at 33 MHz • Price includes 1024 X 768 .28mm interlaced super VGA color monitor, 2 MB RAM, (expandable to 16 MB), 80 MB 15 ms IDE Hard Drive • 5.25" 1.2 MB or 3.5" 1.44 MB Floppy Drive • FCC Class B TUV, CSA, VDE and UL certified

SERVICE AND SUPPORT

— Toll-free technical support telephone hotline for the life of your system — One full year of on-site service included in the system price* — Self-diagnostic software — 24-hour TechFax™ line for instant access to Dell technical information — On-line Bulletin Board to communicate with Dell technical staff and other users — Information Services forum on CompuServe

COMPANY AWARDS

★ Dell has won PC Week Corporate Satisfaction Polls an unprecedented 8 times ★ Dell ranked Best Personal Computer in Small to Medium Sized Businesses in the J.D. Power and Associates Customer Satisfaction Index ★ Dell has won PC World's 1991 World Class Award for Best Service and Support/Hardware



THE NUMBER

800-283-1210

Please reference #11BP1.

To order, please call. In Canada 800-668-3021. In Mexico 95-800-010-0664. Hours: 7 am - 9 pm CT M - F. 8 am - 4 pm CT Sat. 10 am - 3 pm CT Sun.



Fasten your seat belts. Because now you can get the speed and power of an i386™ system without laying out any serious dollars. Or having to deal with a suspect company.

It's the Dell® 325P for only \$1,999. This full-blown 25 MHz, i386DX system with an 80 MB hard drive offers maximum performance at the lowest possible price. So it's ideal for any mainstream business application. And it comes from Dell, a company that has built a \$546 million international business in just 7 years.

When you buy from Dell, you always deal with us directly. So there's no high dealer margins or erratic support. You'll get a computer we designed, manufactured, and rigorously tested ourselves. And it comes with the service and support that helped us become one of the most awarded PC companies in the world.

So don't wait. Call us today for the Dell 325P.

Because even though the price is stripped down, the computer isn't.

**IT'S KIND OF LIKE GETTING A PORSCHE
FOR THE PRICE OF A YUGO.**



□ Limited time offer Special sale price

Lease*: \$75/MO.** - Expires 12/31/91

TECH STUFF

i386DX 25 MHz processor ➤ Upgradeable to i486™DX
33 MHz processor ➤ 2 MB RAM, expandable to 16 MB
➤ 80 MB, 15 ms IDE Hard Drive ➤ 640 x 480 VGA
Color Monitor ➤ 5.25" 1.2 MB or 3.5" 1.44 MB
Floppy Drive

SERVICE AND SUPPORT

On-site desk-side service contract included in the system price the first year* ➤ Toll-free technical support hotline ➤ Toll-free TechFax™ line for 24-hour system information ➤ On-line Bulletin Board communication with technical staff and other users ➤ Self-diagnostic software ➤ Free factory installation of selected MS-DOS® software applications ➤ Information Service Support Forum on CompuServe

COMPANY AWARDS

Dell has won PC Week Corporate Satisfaction Polls an unprecedented 8 times ★ Dell ranked Best Personal Computer in Small to Medium Sized Businesses in the J.D. Power and Associates® Customer Satisfaction Index ★ Dell has won PC World's 1991 World Class Award for Best Service and Support/Hardware



THE NUMBER

800-545-1589

Please reference 11BN9 when calling

Mon-Fri. between 7am-9pm CT, Sat 8am-4pm CT, Sun 10am-3pm CT ➤ In Canada, (800)668-3021 ➤ In Mexico, 95-800-010-0664 ➤ Custom-built and shipped with a 30-day no questions asked money-back guarantee

